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WE HEREBE PRESENT placement of the 12 Spring term graduates, all of the time of instruction—that is the way Parks Air College celebrates the conclusion of its eleventh year of training for leadership in aviation. Each graduate was offered a responsible position in aviation, all but one accepted, and the detailed list for this page shows:

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Pan American Airways, Inc., Division,
Perry, A. F., Flight-Check Inspector,
Trans World Airlines, Inc., Chicago
Rosen, S. Allen, Commercial Dispatcher,
Gates & Crellin Laboratories, Inc., Glendale, California
Orr, W. Franklin, Maintenance Dispatcher,
Pan American Airways, Inc., Honolulu, Hawaii
Kingsley, G. Claude, Service, Technical, Men,
Fox Airlines, Indianapolis, Indiana
Elliott, J. Morris, Apprentice Pilot,
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Wheeler, R. Broderick, Office and Production, Regular
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to advance.

Rosen, A. Jacob, Head Signal Equipment,
Allied Signal Equipment Company, Elizabeth, New Jersey
Moffett, J. Schmid, Maintenance Dispatcher,
National Airlines, Memphis, Tennessee
Hartman, W. William, Maintenance Dispatcher,
United Airlines, Chicago, Illinois

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their friends. It
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by anyone else.



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for year ending July 1, 1938

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Passenger miles flown	424% increase
Passenger revenue	379% increase
Mail passenger	140% increase
Express passenger	193% increase



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the Screw



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goes straight

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Manufacturers Report Assembly

Cuts Cut Up To 50%

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Associate Editor

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Barbara T. Hollingshead
Yale University

Fred Womack
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John W. Hirsch
President and Executive Chairman
John J. Pappas, Jr., President, Elementary Education
William H. McNamee, President, Secondary Education
John C. Jackson, President, Special Education

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Telephone 210-522-1200, Telex 84-1111
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PROBLEMS ARISE FROM THE SAME OBSTRUCTION TO
THE USE OF THE COUNTRY AS A BATTALION BASE. Details and local supplies cannot
be brought in by rail. All roads are cut off. The nearest port is 100 miles away.
The nearest telegraph station is 100 miles away. The nearest telephone station is 100 miles away. The nearest
post office is 100 miles away. The nearest hospital is 100 miles away. The nearest
armored car base, another of the R.A.C. divisions,
is 100 miles away. The nearest town is 100 miles away.
The chief trouble here is that it is the isolated position
which has caused the difficulties. The country is
deserted and there is no one to help.



Mr. Hayford Allen

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Two aviators can do almost the work of a man like Harry Ward. He was not only a president of the Douglas organization, but was active in promoting the industry's best interests everywhere. Later in this issue will be found the details of his career, but we cannot let this纪念 pass without expressing our sense of personal loss with his passing.

We are especially glad that Harry Ward was able to see the first successful tests of the DC-4, for we know how much he himself had put into that development. The nation-wide broadcast on July 25 from the cockpit of the big ship was a fitting tribute to the man who had played a tremendous part in its construction.

Great work on TWA not long ago, fell in with Carl Cover. We were delighted to hear from him just now of the success of the new version of the ship as a whole, and more recently when interested in his account of the action of the tricycle landing gear. What he told us confirmed our feeling that before many years pass some of our landings and takeoffs will be made from undercarriages of that type.

And since this we have had an opportunity to get some three-bladed

What's in This Issue

Every one of the weeks is, of course, the Hopkins Flight and we are especially interested in today's issue to see the results of the recent tests. In the news this week will be an account by Mr. Hopkins of his experiences on the airship flights of the flight, and new articles by members of the American Legion, the Air Corps, and the Army who have been granted to him. One of these stories has been written by Mrs. Ruth Miller of Hopkins' radio. Mrs. Hopkins gives details of the flight's return western overland. General Airways has been mentioned as having recently signed up with Pan American Airways for flights to South America. Our West Coast editor continues what he now sees as a certain trend and gives an interesting look at the notorious pilotage of Roscoe Turner. With interest, we continue to follow the progress of the efforts, the problems of the relationship between science and religion in important. Mr. John Schlesinger, as a member of Congress, has been writing a series of articles on extensive study of the problem and outlines the methods to be followed in seeking congressional solutions. Although Mr. Schlesinger's article was written in 1936, it is described for the last time in an extended article to AVIATION by Captain Winkler, director of established T P Winkler, former Director of the Civil Aeronautics Commission, and author of the "T P's" primer about the A C A and the Civil Aviation Act of 1938.

experience when we flew the latest Model H Ware at Floyd Bennett Field several days ago. Through the courtesy of Ed Erickson we were permitted to make several flights at his general ship after the completion of Jack Lincoln, one of his planes. After making only one trip in the plane itself and another just there to inspect it, we were invited to make a solo flight and said, "Here, you do it." After most of our flying during the past twelve months has been along around in the back seat of transports, we took over with some reluctance, but the minute we pushed open the throttle and started down the runway any fears that we would not manage to get off the ground were all to have been dispelled. Off we went and off we went as naturally as you could pull an automobile away from the curb. In the air we were really beautiful to handle. Under Jack's coaching we brought her in at 1000 ft. over the end of the field, flipped the flaps down and landed with a smooth roll and simply sat tight while the field came up at our feet. Just a bit of a scare before we reached the ground and we were rolling along the runway ahead before realized that we had reached ground. When a hand landed, paid off fast the first time around with no false starts so that, those of us who have not yet everyone to do it, will be able to do it. It was a very con-



From the Skyways
of the World

AMERICA'S PILOTS IN THE KENDALL HALL OF FAME



JET DETHMERS and his MARQUIS-ANDREWS RACING PLANE

On May 30, 1934, Prof H. Dethmers, Chief Pilot of Super Flying Service San Diego Calif., established a new World's Class record for speed in the 1000 Mile race by flying his Marquis-Andreas Gullwing biplane from Los Angeles to San Diego in 1 hr 4 min 4 sec. Dethmers' flying place-using himself, The 2000 Mile Oil. On June 1, Mr. Dethmers again used Kendall Oil in establishing his official Oakland to San Diego record of 1 hr 4 min 1 sec.

IN THE Pacific International Air Races, held at Oakland Calif., 15 out of a possible 16 winning pilots used Kendall The 2000 Mile Oil, in their planes. This 93-75% of the winners in these grueling contests of speed and endurance relied upon Kendall Oil for dependable lubrication as conclusive proof of Kendall's quality. Kendall is refined exclusively from Bradford, Pennsylvania Crude — the costliest crude in the world. Special Kendall refining processes develop to the full its native lubricating excellence. The premium quality of this obtained is protected from contamination by individually numbered, refinery-sealed cans. You will find Kendall The 2000 Mile Oil at most airports throughout the country.

offering documentation and an all-around war-caveover that the thin-skinned kids have really got something.

• **REVENGE** in this aviation business should make a point of visiting the Naval Reserve base in his vicinity every once in a while, for the quality of work done and the sharp shape may be a reminder that the old experience is kept as an inspiration to anyone who has anything to do with aircraft. In Commander Alfred P. Knobell, now skipper of the U.S. Naval Reserve base at Floyd Bennett, it is certainly no becongagement upon the appearance of the base—but the name can be said of all Naval Reserve bases that we have ever seen, from Maine to Seattle.

• **ADMIRAL'S HIGH PRIORITIES** are not necessarily a part of this Department, yet get just a kick out of reading Commander Edward Ellington's "Top Ten" that we want to mention it is just plain. The story of the voyage and loss of the "Jeannette" in the early days of Commander Delos L. Webb, points up the sharp contrast between Arctic exploration in the past and the present. From the sea, the "Jeannette" drifted aimlessly at the mercy of the ice-pack, only to be crushed after six months. After the disappearance of the "Jeannette," the tremendous effort and terrible hard ship could make good only a mile or two a day over the ice fields. Stack them up against the record depths of the Russian over the Pacific and of the work of Ellsworth and Sir Hubert Wilkins. And as the near future is at the top of our list, we hope that New York air liners will be passing on regular schedules over the Long Islets where disaster finally overtook the *Tadpoles* party.

• **FOLLOWING THE DEATH** recently set by Hall Hibbard, Verner Beane, well known to the public as the Good Samaritan Hospital in Hollywood, for his apothecary. At last report he was doing well. Removal of one very sensitive appendix preserved Verner's long standing contention that repeated transmural velocity power drives and HG pull-down had caused his appendicitis to develop up and outside from freight.

• **THE NEW YORK UNIVERSITY** Club was the scene of a pleasant little dinner on July 6th, given by the brothers Townsend and Nicholas Ludington to give Jack Blister an opportunity to demonstrate to air line and insurance executives the advantages of his car-

superiority of the Bureau of Air Commerce. Details of the system will be available in an early issue.

• **IN view of the large eastern cities** an engraver has been named to name the municipal airport, now under construction, in honor of the major. Being familiar with the experience of a large southern city in a similar case, we'd like to suggest naming the airport after it has been completed. In that case, the name would be the name of the project, was named nine years ago, delivered with the ceremony a few years later, and it was decided to change the name of the airport. An investigation showed that the politicians name had been stamped in every brick and cut into the stone foundations of the airport, so that the tile design of the floors, and were onto the tiles and added into the plumes of the restaurant. The citizens had the chance at leaving the name unchanged or building a new airport.



mid-light landing system. One of the advances in the private lighting of uniform intensity along the entire length of the runway, the system of the "Jeannette" was a continuous interference of flood lights, and is said to be presenting no a remarkable degree. Plans are under way to make a test installation of the new lighting at Indianapolis under the



Blister made himself a bicycle leather gear with his competitor's wooden leg



WHEELS DOWN... THEN LANDING IMPACT...

THEN *Braking!*

In no other form of transportation does so complete a change of conditions and of mechanical functions take place as in the moment of ground contact in an airplane. In this instant the shock of landing impact has been absorbed. How flight characteristics become unaccustomed, unaccustomed since my one quick, smooth stopping before wind. Up to a dozen tons must be absorbed from the wheels and landing gear. The left's job is to have enough to break inertia or air resistance. He applies pneumatic energy, firmly. Air and ground resistance in both effect his direction, he varies his braking pressure to compensate bringing the craft closer to a smooth, perfectly cushioned stop. His stress is to keep Bendix Brakes. They respond with greater energy and tremendous effect, because Bendix engineers, with the best of tests on landing gear design and performance at their disposal, have done a superb job. They stand eagerly ready to do the same for every aircraft builder.

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BY
**ROBERT
OSBORN**

• IN RECENT YEARS the Boeing Company has developed a novel system to reduce to their large airplanes. As soon as they roll a new plane out for flight test Company officials announce that it can exceed conventional world short distance record by becoming a longer and faster airplane. This is not a mere boast, however, because the engineers know that the airplane quite possibly may pass the speeds at speeds which a hundred miles an hour faster.

Most of us who make these reports on land agree at least they have had every man fight of airplanes "darkening the skies." We're not talking about the record for our zone, some of which arrived nearly all the airplanes of the Army and Navy, and never were long seen over the stars darkened. On the contrary we could be able to read newspaper clearly, and being able to see greats of such welfare proportions as C. H. Allen and Shirley Schaeffer could at moments of use himself fast.

Possibly the air forces of Soviet Russia and some other European powers could do a better job of displaying if they flew all of their planes at once, but even then we doubt it very seriously. It would be emergency speeds of long-distance runs through the sky cities.

So, if reporters persist in using this phrase in the future, we're going to write lots of letters to their editors demanding information on just how many fast records of illumination was last.

• SINCE LEAVING TURNER has been the captain to commanding heretofore accomplishments with unusual skill and success. He has not yet been to the top board for all eternity. If the patriotic nature of that country ever consider a post command for all of the preceding mentioned flights which have been made we are going to suggest a more versatile at this time-honored scheme of present time. We think it would be much more appropriate for him to be appointed to lose a mount of Greater White, with his head extended in a welcome greeting, and with a properly fresh emission in the large button-hole of his military uniform.

• HARRISBURG, PENNSYLVANIA: Now that we have six-cylinder engines of 1,500 hp as our commercial airplanes and probably still higher ratings available to military airplanes, who remembers the days when everybody agreed that we-needed engines were probably single up to about 200 hp, but liquid-cooled engines would be necessary for new powers above that?

• ADRIEN HARRISBURG: In those days of automation, controllability, full feathering, constant speed, slinger ring, supercharged, hot-and-cold-air-mass-averaged propellers, many early World War planes had to be built around the old cold day when propellers were unknown in as far space time by that fellow down in the rear engine—and



the best propeller was the one giving the highest reading on a spring scale used to the tail of the ship.

• AN ASSOCIATION PARIS statement sets of an agreement between Great Britain France and the United States to set the limit of battlefield size at 5,000 mms and at 2000 mms at certain times. If the purpose of this agreement was to impose any permanent limit on who are using what size of fighting equipment, we think a good policy that could have imposed a. For instance these powers could have agreed just as easily that each battlefield have only two planning steps on the hill and carry out more than the four-legged spring from bowfathers on safety.



* AVIATION for August, 1938 * * * * *

The Appointee—"minis with the hole."

THE LAST AWAITED WHITE HOUSE ANNOUNCEMENT of personnel for the Civil Aviation Commission left us in a flat spin. We were prepared, of course, for a certain amount of deviation from deal in the makeup of the Commission. A perfect lamp would have been too much to hope for. We were optimistic enough, however, to think that there would be enough general strength in the makeup of the Authority to make up for the weaknesses. Shuffling up the names as charitably as possible, the aviation talent on the CAA stands about like a gallon of gas in an empty tank.

The first India load of Jim Farley seems destined to evidence in the details. He has simply added another notable chapter to his anti-aviation record. But that the appointments are one hundred per cent wrong is, of course, as unlikely as their being completely right. It is the shocking lack of balance in the Commission that incident on me so reverent loy.

The choice of administrator was a real surprise. This man is an unusually remarkable fit for such highly technical duties as the design and manufacture of aircraft, or, indeed, pilot licensing. His engineering, radio installations on aircraft, and experience should at least have had some great contact with such matters. Mr. Trotter has done an excellent job in his own field, but his experience has been entirely on the legal aspects of the Treasury and other government departments. True, he did previous service in drafting the Lend-Lease and similar deserved commendation, but his background would suggest an ignorance as legal adviser, or even as a member of the Commission, rather than the job of an chief executive. His meager knowledge of the processes of government should be an asset. Mr. Trotter has a doubly difficult job on his hands of fitting himself in a skeptical industry and then proving that he will carry out his assignments according to his own lights, and not as a rubber stamp for the White House.

With the selection of the chairman we have little enthusiasm. As the creator and exploiter of "Life-Savers" Mr. Noble is a man whose powers, business and executive ability can contribute a much-needed element into aviation affairs at the moment. At least he has had some contact with the industry through his financial activities and ownership of several airplanes. With a properly balanced Commission behind him his fresh approach could be a tremendous asset.

Little objection can be raised over the appointment of

Charles Branch. He has had long and useful experience with the air mail and can make a real (although sparsely) contribution. His appointment was expected and will doubtless be generally approved by the industry. He knows little of the technical aspects of airplane operations, however, and has obviously done nothing with Ross Parker in a bit of dabbling.

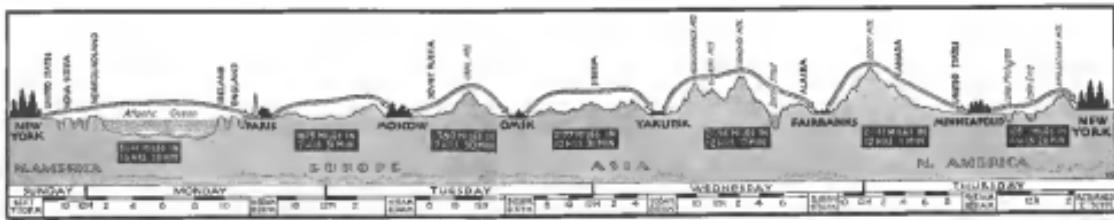
Manion is the only member who has had any really adequate aviation experience, but it has been pretty much one-sided, confined almost exclusively to Pan American's problems in the Caribbean. He has extensive talents and lessons in stability, however.

The other two appointments look pretty doubtful as far as aviation is concerned, and are chiefly selected for showing the commission as completely out of balance toward the political side. Mr. Lyon is a former Federal Power Commission lawyer (allegedly a Left Wing New Dealer with a yen for public ownership) but with no aviation experience whatsoever as far as we can discover. Mr. Bradley claims a long-standing interest in aviation, known to be a persistent voter registration, and once had an interest in a new efficient flying service in Oregon, Wash. Lately he has been WPA Administrator for the western states, and is said to be a pal of Harry Hopkins. At best, his total aviation record could be investigated by a hundred more qualified men than we could name. The administration of one sound aviation act of long experience by either of those two would result in giving a certain semblance of balance to the whole, and would have changed the situation.

The safety board appointments, however, make vivid areas. Both Hardin and Rosen are men of potential experience, one as an airline pilot (as required by the law), and the other as an airport engineer (WPA). MacBride will depend on the third appointment. A trained aeronautical engineer with sound practical experience would round out the safety board very neatly—another politician would rate it. A technically strong safety board which sets up in due time a good deal more than investigation of accidents, etc., as a technical advisory body, do a great deal to bolster up the Authority.

Well, the law is now the law, and the Commission is now its administrator, and we are going to have to live with both of them for a long time (unless the Senate refuses confirmation next January). Instead of being able to take off immediately on a new program of aviation like America as we have confidently hoped, at best we have got on our hands another long-term educational job that cannot be completed before any really worth while results can be expected. We will all have to be extremely patient and extremely cooperative, as it will take the Commission a long time to get its feet on the ground and find out what this business is all about.

Suspicious Changes—Four changes in the Civil Aviation commission for larger management posts. Top to bottom: Trotter, General manager; Manion, Vice-chairman; Charles Branch, Commissioner; and Lyon, Secretary. All but the Commissioners were ex-airmen.



91 Hours, 8 Minutes, 10 Seconds

EVERYONE'S World is a little different this month than in previous programs. Even the housewife of Keokuk, Iowa, who will never travel farther than Chicago has remake her picture of the vastnesses of the earth's distances. That young Hughes can get to Siberia in less time than it takes Count Gérard to drive down from Duluth, why, it makes Europe and all those foreigners seem like they were just living over in the next state instead.

To the people who travel for business, for pleasure, for education, air transport is some shades more safer, dramatically more sure. As the world's air lines take up what is left to certain to be their last postulated mission in the North Atlantic, the social conscience of the airplane has been driven into the public consciousness like a spike hammered into a railroad

TAINTON has spared no effort to bring his readers the complete professional background of the Event of the Year. On following pages are articles on Hughes' radio and weather forecasting set-ups. On page 49 is a description of one of the top's prime navigational assets—the Farnell-Maxon position recorder. In the AVIATOR this is a complete review of the flight's astronomical background and leaves together with a summary of photographs of various phases of the flight.

Macmillan thus could be no editorial complainer we could wish to hold the station of Hughes; our memory of his first air delivery to over NBC in response to his New York station. It might stand for all time as the professional aircraft's exhibition of the achievements of the untrained aviator.

Gratulations we give you Mr. Hughes.

I am very good at making speeches, and I have exercised it well, not only because there is one thing about this flight that I would like every one to know. It was on my way to a start. In with the carrying out of a plan, and I am accustomed to believe it was everybody present.

We who did it are entitled to no particular credit. We are no experts or anything of that sort. Any one of the twelve pilots of this nation, with any of the trained Army or Navy navigators and competent radio engineers in no

way at our aviation passenger transports, would have done the same thing. The twelve pilots of this country, who in my opinion are the finest flyers in the world, had much better equipment than we had. Every Wright had the right kind of equipment of this country.

It could be said any one of the men who directed and performed to the present remarkable state of efficiency the sixteen American flying machines and its equipment. If we made a fast flight it is because many young men in this country turn to engineering

schools selected based on driving tables and designed a fast airplane and navigation and radio equipment which would keep this plane upon its course. All we had was to operate this equipment and place according to the instructions book accompanying the article.

The most advanced and newest equipment developed by navigation and radio engineers furnished us with such accurate information to the position of the plane at all times that I was unable for the last trip we traveled

only twenty miles apart than a direct course between the various points at which we stopped.

The reason for this is because it was the product of over 200,000 engineering hours. Young men now taught mostly at the California Institute of Technology, working in a factory in California, put in 200,000 hours of accumulated thought to develop that machine.

Flying at all times at the altitude which was most favorable to the operation of the plane with the load aboard at that particular time—the load normally varying continuously as the fuel was consumed—using the amount of horsepower at all times which was required to fly the plane and completed day flight without at any time using more than 180 of 625 horsepower per engine approved by the Department of Commerce for normal cruising. In other words, this was in

no way a race or a stretching of the machine or its engine. The return flight was also steady, using those same instruments frequently at 625 horsepower power.

There is one thing about the flight which please me more than the actual time which elapsed, that is the fact that we made no unscheduled stops or arrived at our destination within a limited time of the time which we set as our arrival time.

Further than that, I hope that this flight may have served in a small way to re-establish the United States in friendly competitive flying activities with the rest of the world. The aircrafts we used were ordered from the United States, yet some firms in the nations of Europe have taken from us as one by one every record of major importance.

The speed record for seaplanes is held by Italy, the speed record for land

planes by Germany, the altitude record is held by England, and Russia, will probably hold the flight of last year, and probably hold the distance record for a long time to come.

If this flight may have demonstrated to Europe the fact that American engineers and American workmen can build just as fast and just as efficient an airplane and its equipment in any other country in the world, then I sincerely wish it has been well worth while.

And if possible through that the European nations may realize, even a little more than they already do, that our planes are inferior to none, and if our planes are inferior to none, and if our planes of seaplanes to those press salons may increase only a little bit, then failing to work more and in the annual fairs in this country that I shall feel more than ever that the flight was worth while.



Hopkins in Potosi



Charles F. Jenkins, radio engineer for Howard Hughes, helped Richard Bedford to set up and run the ground controls throughout the flight.

THIS IS THE COMPLETE RADIO PICTURE of the Hughes flight; it is necessary to cover it from two different points of view. The first, perhaps of the greatest interest, is the installation in the plane itself. The second covers the arrangements made for control and communications from the ground.

The installation at the airplane is one of the most complete ever attempted and was designed to fit all circumstances that could possibly be foreseen at the beginning of the flight. To accomplish this a wide variety of receivers were built up so that no one need develop and plan to build them. The idea of most importance was to always have available complete duplicate equipment in case of any failures and it is for this reason that three transmitters were taken on the plane.

The main transmitter was a 100-watt affair designed and built by the Hughes Aircraft Company. This transmitter operated on CW, HEW and radio phone. It operated on 18 crystal controlled frequencies ranging from 2500 kilocycles to 10,000 kilocycles. The radio phone employed 100 per cent modulated and was designed to eliminate noise static. This transmitter was located within easy reach of the operator in the forward radio compartment in that several frequency changes could be made in minimum time. It was this transmitter that was

Howard Hughes RADIO

By Donald Fink

*Radio Editor, *VISOR**

used throughout the flight for almost all communications work and relay between stations.

The second transmitter (a Bendix) also had 100 watt power with 18 frequencies, duplicate circuitry of the frequencies used in the Hughes transmitter. It was intended as a fail-safe of defense in case of failure of the main transmitter.

This second transmitter was combined with a receiver to form a complete emergency station. It had a power of 15 watts, CW or RCM on 18 crystal controlled frequencies ranging from 16,000 to 20,000 kilocycles. The receiver had a standard frequency range. The power supply provided for the transmitter was available from three different sources adequate to take care of various forced landing situations. A hand driven generator could have furnished power to both the transmitter and the receiver indefinitely, and in case of any change or loss in the hand driven generator, there was a provision for automatically cutting in the alternate power source in the absence of standing waves on the line.

The electric reel was coupled in the main transmitter up forward by means of a 300 ohm concentric transmission line provided with a means of indicating to the operator when the antenna polarization was correct. There was also a provision for the issuance of standing waves on the line. The antenna length could be stated almost any odd number of quarter waves long with little trouble. By varying this number of quarter waves the directivity of the antenna could be controlled to give the power radiation a narrow directivity. This was done by the transmitter and the receiver for the emergency transmitter where subsequently it was followed long enough while being sufficiently buoyant to float easily. The total weight was approximately 100 pounds. In the event of the hand driven generator failing a hand and a battery were available to drive the receiver in case of other emergency power supply.

The receiver complement included two Bendix superheterodyne receivers for both local and high frequency. One of these receivers was for communications work and the other for direction finding in conjunction with the Bendix low loss unit. The third receiver was the emergency receiver already mentioned. The fourth was a Faraday loop receiver used with the Keeney radio compass.

(Turn to page 77)

Howard Hughes WEATHER

By Daniel Sayre

*Assistant Editor, *VISOR**

THE PROBLEM of providing weather information for a flight which was so extensive as Howard Hughes' round-the-world flight, in one which requires considerable organization, begins along time which will lead to success or otherwise. One of the first difficulties which arises presented itself early in that collection of weather observations came off so soft that they were observed as being too soft to allow a thorough analysis. In order to provide this data W. C. Blackadar flew out to a suitable weather station at 0800 GMT and selected the first available weather station which provided data from meteorological stations on various parts of the Southern Hemisphere. In order to facilitate the organization of the radio phase of this project the receiving region was divided into the following regions: Africa, Asia, Australia, Europe, North America, South America, and the whole thing placed under the direction of Mr. Charles Freire. He also provided for weather relays, relays, to simplify the problem of obtaining observational data in North America.

There are several regular radio transmissions from numerous stations in Europe which provide partial data, but in order to provide the safety of the flight this data alone is not quite necessary to have the maximum of completeness in the data transmitted.

It was necessary to receive all

of the transmitters from stations in London, Berlin, Paris, Rome, Moscow, Manila, Honolulu, San Francisco, and Arlington, to obtain sufficient coverage of the rest of Europe, of course, and to cover the North American continent.

One example of the extent of the data received by the transmitter which was recorded each day is this:

"London, 1000 hours, 1000 hours,

1000 hours, 1000 hours, 1000 hours,



Checking Up



Whalebone shows no bone fluid. But no more rare or older which by 1000 miles or more.



average of less than three to an average of more than eight. And as new planes, regimens, and instruments have been tested the Brunn shape for remembrance, change has become a task with the organization. Every move made by Brunn's organization seems to have birth of it the thought that to-day's best methods will not be good enough tomorrow.

Bob at Brewell's maintenance wheel is Rougemont Standard maintenance superintendent. Around him he has built a team that any maintenance man and indeed, any employee of ours, might well envy. In these men the jobs they are doing are the most



Walter Henshaw
Manufacturing Bookagent Shop Sandy Sherrill
Sherrill Manufacturing

ONE OF THE MORE PERSUASIVE and inspiring chapters on the record of utility management is being written in the shops at Bessell Arrows at Dallas, Texas. From the original three-man staff, the Bessell Corp., the Bessell Corp. has grown through acquisition of all-wood Lockheed, through affiliation with Lockheed Electric, in the present form of Douglas-DCD and Lockheed Electric. As the number of planes in service has grown, and more and more planes have been built by Bessell, the company has expanded its facilities as much as feasible for reliability of equipment in service and low cost of maintenance. Plant hours few days late have resulted from an

第10章

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Airways

Cutting Through the Heart of America from Chicago to the Mexican Border, Bismarck Makes Connections with Every Major System on the Continent.

curiosity and longing in the world. Each casts slopes and locusts his special brand of miasma. And together they make the present job and the future problems with a hemispherical which will tolerate nothing short of perfection.

service work. Before coming with Gulf Airways he took charge of maintenance. Shuler had worked with Southern Air Transport, Gulf Coast Airways, American Air Lines and Delta Airlines, in addition to being a flight instructor.

such a background of pre-cremer and technical training has continued a rare quality of men qualified as he usually do the job to which assigned. The result has been a marked improvement in the quality of work and in the speed of execution. In the maintenance system every effort is directed at increasing the efficiency and the intensity of the job, whether it may be as an a crew stand at the shop or as a single man working anywhere. When Flinland took charge of construction it was evident completely disengaged 36 of them in use in construction work, maintenance, inspection. A study of all maintenance was made and the various methods adopted were developed.



The new laboratory design will be straightforward, spacious and sensitive to the environment.



The Sun—Battery Blasted
Baptist Ministers Banished



George Corinth Frank Dyer



E. H. Bradley

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By
George S. Schairer
Certified Aircraft Corp.

The big questions asked about big airplanes today are: How far will they go? and How much will they carry? Another question which is almost secondary in importance is: How long will it take them to get there? The purpose of this article is to indicate a way to answer these questions.

RANGE vs. PAYLOAD

THE RANGE OF AN AIRPLANE is influenced by its weight, speed, and load, engine R.P.M., and other factors. The effect of each item can best be studied by looking at how each affects the miles per lb of fuel of the airplane. The miles per lb of fuel at specific range, η_{RANGE} , is equal to the range, R , divided by the pounds of fuel used per hour. The power required at any given condition of speed and altitude is given by the familiar formula:

$$P = \frac{C}{\eta} \cdot \frac{W}{2} \cdot V^2 \cdot S \quad (1)$$

The power available from the engine-propeller combination is $\eta_{PROP} \cdot P_{HP}$. Efficiency η_{PROP} is η_{RPM} per engine + 5% margin. In level flight the power available must be

equal to the power required. Hence we have

$$\eta_{PROP} \times \frac{C}{\eta} \cdot \frac{W}{2} \cdot V^2 \cdot S = \eta_{RPM} \cdot P_{HP} + 5\% \text{ Margin} \quad (2)$$

The simplest used propeller power coefficient

$$P = \frac{C}{\eta} \cdot \frac{W}{2} \cdot V^2 \cdot S = \eta_{RPM} \cdot P_{HP} + 5\% \text{ Margin} \quad (3)$$

is useful at this point. The η_{RPM}/η_{PROP} ratio in equation (3) will be replaced by

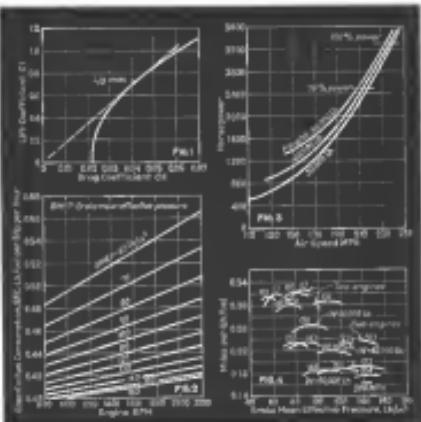
$$\eta_{PROP}/\eta_{RPM} = \frac{\eta_{RPM}}{2} \cdot \frac{V}{C} \cdot \frac{S}{D} \quad (4)$$

$$\eta_{PROP} \times \frac{C}{\eta} \cdot \frac{W}{2} \cdot V^2 \cdot S = \eta_{RPM} \cdot \eta_{PROP} \cdot \frac{V}{C} \cdot \frac{S}{D} \cdot W \quad (5)$$

This equation is simplified to

$$\begin{aligned} \eta_{PROP} &= \frac{C}{\eta} \times \frac{W}{2} \times \frac{S}{D} \times \frac{V}{\eta_{RPM} \cdot \eta_{PROP}} \\ &= \frac{C}{\eta} \times \frac{W}{2} \times \frac{S}{D} \times \frac{V}{\eta_{RPM} \cdot \eta_{PROP} \cdot \eta_{PROP}} \end{aligned} \quad (6)$$

The last part of this equation is the ratio of the weight to total operating propeller disk area. The value of η_{PROP} is the propeller power disk loading efficiency. If the propeller is power delivered by the propeller, it is possible to plot curves of propeller power efficiency versus VMWD for constant values of η_{RPM} . This was done for the three blade propeller tested by Goss and the results are plotted in Fig. 1. The curves for η_{PROP} show that for a constant value of η_{RPM} there is a corresponding value of η_{PROP} and a unique variation between η_{PROP} and VMWD. Thus knowing η_{RPM} and η_{PROP} , the propeller efficiency is readily determined. Since η_{PROP} is determined mainly by the altitude of the airplane, the efficiency is a function only of the ratio of forward speed to propeller RPM for any given



altitude and, as the airplane is flying at constant speed, altitude and weight, the VMWD curves of propeller efficiency are identical. This gives a very direct method of obtaining the effect of RPM on propeller efficiency.

To describe the method of using this chart the following range-a-sample computation has been made for a typical airplane. The airplane used is a Boeing 300 lb. 4-engined transport. The engine is a Pratt & Whitney R-1830 twin row displacement engine 18 to 6. They are rated at 1500 HP at 3500 RPM or 5000 RPM. The cruising rating is 2200 RPM and $\eta_{RPM} = 160$ RPM. The propellers are 13.5 ft in diameter with three blades. The airplane itself has a wing area of

Crosses (see page 711).

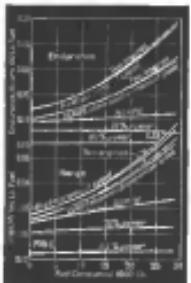
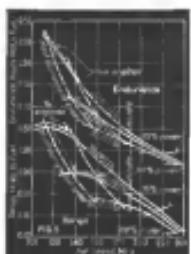


Table I
RANGE CALCULATIONS
Example Airplane—10,000 ft

Altitude ft	Weight lb	Propeller Power Coefficients										Range miles	
		100% Power	70% Power	50% Power	30% Power	100% Power	70% Power	50% Power	30% Power	100% Power	70% Power	50% Power	30% Power
10,000	1000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000
10,000	2000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000
10,000	3000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000
10,000	4000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000
10,000	5000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000
10,000	6000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000
10,000	7000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000
10,000	8000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000
10,000	9000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000
10,000	10000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000
10,000	11000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000
10,000	12000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000
10,000	13000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000
10,000	14000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000
10,000	15000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000
10,000	16000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000
10,000	17000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000
10,000	18000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000
10,000	19000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000
10,000	20000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000
10,000	21000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000
10,000	22000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000
10,000	23000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000
10,000	24000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000
10,000	25000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000
10,000	26000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000
10,000	27000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000
10,000	28000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000
10,000	29000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000
10,000	30000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000	0.000000000000000



Model 20 Transport

By T. P. Wright

*Director of Personnel
Curtiss-Wright Corporation*



SAFETY AND ECONOMY—these qualities have major emphasis placed throughout the development of the Curtiss-Wright Model 20 Transport. These design requirements suggest that consideration has had to be given to the point of value in respecting these qualities before an adequate model has been established. In designing for maximum safety and low operating cost, the Model 20 has met the first two of the need for optimum performance. Safety, in fact, when attained by judicious means, is a component of economy; for maximum comfort for reliability and for economy.

Convenience equals not only suitable arrangement of seats, tables and also the use of shelves. The "easy Rider" here is the Model 20 represents a real asset to the air traveler, permitting him to take full

advantage of scheduling his work and of the speed of travel which flying inherently affords. Numerous factors enter into the safety of flight, however, and Curtiss-Wright feels that a plane accommodating thirty passengers with a great degree of comfort and luxury would be best suited, particularly to towns large centers of population, to make possible frequent and reliable service demands of the air traveler. Whether rail transport can merit certain functions, as traffic by addition or removal of machines from a given train, air transport must have a service-oriented demand unit of such sort that the dual requirements of speed and economy, and large passenger capacity can be simultaneously held. However, not too small a unit can be used, as that sufficient comfort, luxury and spaciousness are



Charles Francis Field, manager of the St. Louis plant, and George Page, director of engineering, who are shown in the cabin of the Model 20 which was developed. Note method of opening the pressure-sealed door.

A further point emphasized on this airplane is economy afforded for heavy mail and express. The 600 cubic feet of space provided for these items immediately indicate to anyone comparing these requirements the thought which entered the designers for a model of aircraft which could offer maximum economy in carrying a heavy cargo load with less passengers. The one is no way conflicting or interfering with the other. All mail, express and luggage is located under the floor. Access to it is from the outside by means of large doors in the floor. These doors are readily manipulable by levers from the outside. Furthermore, all of the space mentioned is available unoccupied for payload in a separate compartment under the wing of 70 cu ft, is provided to house accessories such as batteries, auxiliary tanks, hydraulic oil supply tanks, electric fuel tanks, water make valves, etc.

Not to offend, since flying flows in a luxuriant cabin, passengers are unseated in field or suitcase in rate on a 30 min. comfortable ride on a rubberized floor. Maximum speed is 160 mph, providing a value figure of over \$3.50 cents per passenger in a value losing dimension of 6.9 ft. high by 8.75 ft. wide (at window height) by 26.3 ft. long gives a use of such spaceconcern that further increase would not provide proportionate increase in comfort and luxury. It is done away at all.



A further point emphasized on this airplane is economy afforded for heavy mail and express. The 600 cubic feet of space provided for these items immediately indicate to anyone comparing these requirements the thought which entered the designers for a model of aircraft which could offer maximum economy in carrying a heavy cargo load with less passengers. The one is no way conflicting or interfering with the other. All mail, express and luggage is located under the floor. Access to it is from the outside by means of large doors in the floor. These doors are readily manipulable by levers from the outside. Furthermore, all of the space mentioned is available unoccupied for payload in a separate compartment under the wing of 70 cu ft, is provided to house accessories such as batteries, auxiliary tanks, hydraulic oil supply tanks, electric fuel tanks, water make valves, etc.

Promotion of the oval shaped fuselage is provided for on such a fuselage structure as to make possible weight reduction above described while weight increase when a rectangular shape would present substantially greater. The answer is the use in areas outside of two circles, in

turning in such a manner that the base poses three points of attachment, thus acting as a lever to help withstand loads caused by the motion of the tire circles, when under pressure to support. Eventually, the practice of using a single circle as to prevent a single application as well as a change more inexpensively.

In the development of the design techniques of the fuselage pressurization as well as in the development of means involved in trapping the plane for high altitude flying, in general, the progress made has been due to the services of Dr. John B. Younger who gained a vast experience in this work through his early association with the pioneering efforts of the United States Army Air Corps in a high altitude development program at Wright Field. Dr. Younger is now engaged in similar work in the field of aircraft and the use of pressurization of the fuselage.

The degree of pressurization provided for structurally is such as to permit normal seating at 20,000 ft altitude with equivalent "value altitude" of 5,000 ft. Or, alternatively 11,000 ft. using altitude with seat belt, above pressure.

The following accompanying data describes the Curtiss-Wright "20" to be a twin engined, and wing monoplane of all metal stressed skin construction. The engines used are the Wright 14 Cylinder Double Row Cyclone with take-off rating of 1,600 (Turn to page 30)

In the cockpit, note continuous wheels and the separate arrangement of controls on platform between the seats. The instrument console can be seen to the center of the board, below the Sperry pilot.



The cabin interior is easily well fitted. Additional two groups of five seats each (seated) can be made to face inboard for luncheons or for lectures.





The Birdmen's Perch

Birds & I know the Perch gets around. This month we run both a couple of British correspondents—Greville Mason, of London, England, and George P. Gurney of New Plymouth, New Zealand. To these and all other correspondents—Abbot! And he's here, a Whopper, it Puttle sometimes, or a nice social letter from the rest of our readers.

HARRY H. WILLARD, 2000, Toronto Star-News, Inc., 2000 Avenue of the Americas, New York 10011. Postage: 75¢.

WHAT-HAPPENS-WHEN-A-BIRD ETC. DEPT.

Incomplete returns prevent our publishing the final note on this much debated subject. But we thought you might like to know the score is awful close—the bird is ruled dead—and now, too, can hardly wait till next month for the results.



THE PUZZLER COURSE

This month's problem is a riddle. But we were very taken with two looks at your answers before you mail them in to check. Good luck to all. Write to Harry Gurney of Springfield, N. H.

A clock at the center of an oil company whose name we want to mention looks something like this:

It takes the clock 30 seconds to strike one o'clock, how long will it take to strike twelve?

(What did we tell you?) (11 MAY 1957)



that all birds drag us
To sleep long as we're

second solutions to the bird scratches in our "What Happens When a Bird..." column. Check Ralph J. Wilberforce's week—Duncophile—W. M. Sheldoff—Anne T. George M. Corcoran—Wren C. Fronce—Henry Morel—John A. Holt—Jack Tully—John W. D. Smith—John L. S. G. Edwards—Edgar P. Sharpe—Cameron MacIntosh—Walt Goldfarb—Kenneth Price—John Bishop—John S. Kimes, and several solutions of others introduced as given permission to publish their names.

Postmark and telephone all!

FLASH SCOOP (EXCLUSIVE)



Gulf runs a bar on all oil wells with no longer than six hours and twenty-five Gulf jobs—the world's fastest for planes.

This remarkable, Gulf-wide process—employed in addition to continuous installations—is down to less than the 1955 Pary Penitentiary—reduces in each to 20% more motor-maintenance charges and waste.

THIS MONTH'S WHOPPER

Come, gather round, my brothers,
For now at last von Hoot
Has hit. Below comes to rest
The yearly spring bon-



HONOR ROLL

While we're on the subject of planes and birds as well as man here are the following who soloed

AVIATION
August, 1957
25

GULF
AVIATION
PRODUCTS

Many a modern housewife would be glad to have an instant and convenient television.

—HARRY H. WILLARD

2000 Avenue of the Americas, New York 10011. Postage: 75¢.

© 1957, Gulf Oil Corporation.

Cruising Speed at 3000 ft... 380 mph.
Cruise Single Engine Field 11,000 ft.
Take Off Distance over 30 ft... 1125 ft.
Landing Speed... 110 mph.
Operating Cost per 300 ft... 1.00 per mile.

100 ft.

The accompanying pictures also

show the extent to which the de-

signers have gone to insure

safety and convenience in this radio

aircraft arrangement. The model described by several operators who have re-

ported it in the most complete ever

constructed, has made it possible ac-

cordingly to determine the opinion of

a great number of people, of all types,

of sailing experience, their designs,

weights, dimensions and power require-

ments, helping arrangements interior

decorations, etc. In this latter regard,

the expert involved at Ray-

mond Leroy, Inc., famous designer for

various cabinet projects, including

the Transamerica building at the

New York World's Fair, have been

studied.

Great care has been taken to reduce

noise and vibration to levels lower

than any yet recorded in air transport.

Considerable space has also been

taken to eliminate all cabin marks

and to eliminate pressure from the

cabin to eliminate comfort losses.

Space and economy is gained at

the cabin, have created the greatest

advances throughout the design stages of

the development. A further demon-

stration is in how that plane is de-

signed to sail in those qualities will

now be given.

To provide an example of inherent

safety characteristics, it is necessary

to guard against qualities which are

examples of accident reports shown are

the extent, directly or indirectly, of the

accidents analyzed. The following

statistical figures, representing the

sums of several accidents, averaged

for all aircraft, are given for the

average aircraft and, as they apply to

the airplane itself, steps were taken to

separate conditions.

Aircraft Accidents (1957 Average)

Down	95
Parasited	21
Powerplant	4
Structural-Landing Gear	10
Other	2
Wing and Tail	19
Wing and Terrain	1
Wind and Dashed	15

Pertinent attention to the first four

descriptions as given in these are the

ones in which the airplane itself suffers

an injury directly or indirectly.

The last three percentages represent causes

(Turn to page 47)



by stick and steering rating of 500 pounds is needed to position the nose at engines at 2200 lb. each. The propellers are Cessna electric, all feathering, constant speed, controllable pitch type. The design gross weight of the plane is 36,000 lb. It has a span of 36' 6", a wing chord ranging from 18' 8" to 53' 8", and a length of

25 ft. Although originally to be positioned as a 10-passenger "step" plane, it will alternatively be offered as a 10-seat "skipper" plane.

The following table shows the important structural performance characteristics:

Mission Level Speed at 12,000 ft... 290 mph.
Cruising Speed at 30,000 ft... 300 mph.

AVIATION
August, 1957



In the Air CONE GEARS SAVE PRECIOUS POUNDS

For aircraft, Cone Worm Gear's vastly greater load carrying capacity and efficiency is today contributing increased reliability and durability, with

less gear weight for such parts as aileron controls, retractable landing gear,

controllable pitch propellers, gas synchronizers, etc.

ARSA CONTACT—machined into Cone Gearing by an exclusive manufacturing

process—means just that:

either smaller gears of equal

load capacity—or greater capacity for the same size gears. Either way, Cone

Gearing offers manufacturers of all types

of worm driven equipment the lowest cost per horsepower. Imperial tests and years of service prove: Four times the A.G.M.A.

mechanical, twice the A.G.M.A. thermal rating. The highest efficiencies known.

Up to 30 times the instantaneous tooth contact. Ratios of 150 to one, or 1 to 6. High speed or heavy duty.

No special lubricants. And

Cone gears—both worm

and wheels—wear it, not

it. In other words both

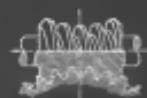


Diagram 1 shows how the teeth mesh at an angle to the center line of teeth.

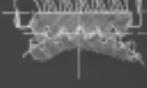


Diagram 2 shows how the teeth mesh at an angle to the center line of teeth.

regenerate as wear occurs. In conventional worm gear wear destroys the worm form.

For further information on how Cone Gearing is doing a better job on all kinds of equipment, send for Bulletin No. 101-51.

MICHIGAN TOOL COMPANY

7171 E. McNICHOLS ROAD

DETROIT, MICHIGAN

load than a simple robot gear, and considerably more power is being delivered at constant rpm. This is multiplied through using the two engines together. Also there are definite financial economies through elimination of needless structures and duplicate engine mounts. While the present conditions is merely of a somewhat nature, the future is promising. And when we consider that type of drive, while hardly preferable to solid sprocket could surely be used with the Vee type or line engines, it appears that a new field of development has been opened to the aircraft designer. With Fairchild's Hanger gear, the type of installation could deliver upward of 100 hp on a single propeller, and with the present Allison liquid cooled engines, this could be ramped to 2,000 hp per propeller. Not only does this suggest possibilities for a 2,000 hp fighter, single engine aircraft, but, in addition, it will bring us the all-type fighter, with the possible future development of a super-fighter using four Allison and two propellers to obtain a very clear margin with a total of 4,000 hp. Furthermore, the single propeller plane with Allison drives would be particularly well suited for the close-bombing operation with the nose at the same time providing two-engine reliability for over-seas flying. Other military advantages of the installation are apparent, such as the possibility of doing a nations job through the short follow-up propeller units.

On its test flights the Allison powered Aeroneer has shown a marked increase in apparent efficiency in landing from other single-engine craft. One of the possible advantages of this drive is that it is unnecessary to slowly synchronize the two engines when one engine develops apparently more torque than the other. The result is a much more efficient single propeller drive. When either engine is engorged or disengaged there is no noticeable mechanical shift. The instant speed propeller control provides optimum propeller efficiency with either a high engine rating. And if one engine fails, the other can immediately assume enough power to deliver its full power without the hampering effect of the dead engine and propeller, and the off-center action of the live propeller as in a conventional two-engine plane with each powerplant set some distance from the center of resistance of the airplane.



The Aeroneer and the Douglas DC-4

PHILLIPS Aeroneer

Two place Metal Ship Receives Type Certificate

A APPROVED TYPE CERTIFICATE has been granted the Phillips Aeroneer following successful completion of flight tests. This plane is the first all-metal Aviatrix model of the Aeroneer. Only 100 of all-metal construction, and was designed in an attempt to bring maximum plane design to the private airplane field. The Aeroneer is a low wing cantilever monoplane seating two people side by side in an enclosed cabin. It is powered with a massive C-1 engine of 125 hp. Top speed of 129 mph. in the figure set by the manufacturer.

An interesting development of the flight tests was the method adopted to obtain without effect on the rear portion of the wings which had been originally well balanced. An airfoil with a sharp leading edge and a long trailing edge was used. The Aeroneer showed a tendency to drop a wing during early flight tests due to the effect of top and bottom camber loss of airfoil section. This was overcome by adding a leading edge to the leading edge of the airfoil, plus slight camber to the trailing edge of the airfoil. This was so designed as to change the angle of incidence of that portion of the airfoil so, reduce the angle of camber approximately three degrees, although leaving the basic wing camber unchanged. The result has been to eliminate tip stall completely and provide

minimum airfoil control even with the airplane at or near the stall. In future models 30 degrees of wash out will be built into each wing tip.

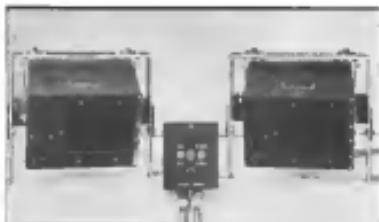
The Aeroneer has been fitted with the Marmon 26 engine at 150 hp and with slightly larger wing panels. Upon completion of flight tests of the most powerful model it is to be taken to Wright Field and to Randolph Field for an extensive test period to determine the desirability of using this type plane as a primary trainer.

Specifications and performance figures released by the manufacturer are:

Span	37 ft. 6 in.
Length	28 ft.
Height	7 ft. 8 in.
Total wing area	160 sq. ft.
Wing loading	15 lb.
Power loading	13.6 lb.
Empty weight	Marmon C-1—525 lbs.
Flying weight	1000 lbs.
Gross weight	2200 lbs.
Take-off weight	4000 lbs.
Rate of climb	1200 ft.
Cruising speed	112 mph.
Landing speed—flaps up	40 mph.
—flaps down	49 mph.
Take-off run	70 ft.—full load, no wind.
Crosswind	300 miles, optimum crosswind.
Initial climb at sea level	625 ft. per min.
Service ceiling	11,800 ft.
Absolute ceiling	14,000 ft.

World's Largest Passenger Airplane ...BOEING 314 Clipper

CENTER OF interest in the forward-looking world of aviation is the latest product of the BOEING AIRCRAFT COMPANY—the giant BOEING 314 Clipper. The enormous project of designing, building and testing this largest of all passenger airplanes, which first took to the air in June, is now entering its final stages as the big clipper is being made ready for rigorous Department of Commerce tests. The 41-ton, 74-passenger flying ocean liner and its sister ships now under construction will fly the Atlantic and the Pacific under the famed banner of Pan American Airways.



Automatic Instrument Log

SHORT TIME AGO THE MINDS AND Irving Minoff, of the Bureau of Standards, and the management of the Pan American Airways and the Boeing company were at odds that had developed in an extension of work started years ago with Shirley Schrader's "box in the box." The original idea was to crop certain flight instruments with a camera at a box so that they could be photographed periodically for a permanent record. Both Minoff and Schrader worked on the development of the idea. When Minoff went to Boeing he worked some sort of photographic apparatus developed that would provide a continuous photographic record of the instruments and control positions on an airplane cockpit. For obvious reasons he specified that this apparatus should be capable of taking photographs in either daylight and also at night without disturbing the cockpit or any member in it except the pilot or to affect his normal sense untilts or outside the cockpit itself. He specified also that photographs should be taken at intervals of approximately one minute during normal operation and at five-second intervals during maintenance. Other detailed features were such details as magazine film loading, maximum coverage in the lenses, and operation without assistance by pilot.

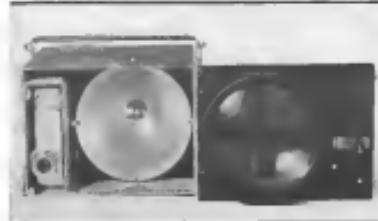
The Boeing Aeroplane Control Corporation, which began its own research and investigation to determine the best method to employ. Their work covered a study of illumination by means of ultra-violet rays, spark discharges of extremely short duration, and infrared. The latter seemed to

give the greatest promise, both from the standpoint of the results obtained and the fact that it did not require light and source. Progress of the tests were an antecedent to Mr. Minoff and the Department of Commerce drew up a specification and awarded a contract for the first unit.

The instrument consists of three units. Two cameras and light source blocks, one of which contains a tungsten filament lamp, and a control box containing a motorized switch, a timer, a receiver connected together and to the plane's battery by means of radio-shielded cables. The cameras are designed for suspension from brackets attached to the roof and rear wall of the cockpit. The source box may be mounted on any convenient location, preferably within the field of view of one or both cameras. It is in this unit that the timer is located at which the cameras are operating.

Each of the two cameras has an

area of the lens wide open to show light source and camera. The timing mechanism is located behind the lenses.



Total weight of the Pan American Clipper, including cameras, cables, etc., averages length, approximately 20 lbs. Each camera and light source weighs approximately 8 lbs. 2 ft. 7 in. x 6 ft. 6 in. x 8 ft. 6 in. Total height, 5 ft. 10 in. x 6 ft. 6 in. x 8 ft. 6 in.

own elements associated with it in the same housing in such a manner that the light is at all times directed toward the camera that is covered by the lens. A condenser lead and a wire red filter for the lamp and an infrared filter for the camera are mounted at the center of the unit so that the lamp and camera are easily accessible. In one of the units, a timing mechanism is located in back of the lens. The control box contains the power source of the lights and cameras. Both cameras are controlled by the same mechanisms so the photographs are taken simultaneously at each shot. The timing mechanism lights the lamps, a half-second before exposing the cameras, so that they will reach full brightness before the cameras are triggered. A half-second later the lamps are extinguished. Thus the cameras are triggered by only one second resulting in low consumption.

Photographs may be taken at the rate of one every minute or one every five seconds, selection of the speed being by means of a switch located on the control box. Signal lights on the control box indicate the speed at which the cameras are operating. One light indicates 1-minute operation and a red light indicating 5-second operation. The control box also contains a 'on-off' switch, and a combination time and thermal cutout to protect the battery from a short circuit or excessive exposure.

Each camera has a removable cover which is held in place by a strap which will hold 25 lbs. of weight. This is sufficient for 16 hours, 40 minutes operation at 1-minute intervals, or 1 hour, 23 minutes at 5-second intervals.



New Equipment for Communication and Navigation by Don Fusk



Instrument-Landing Progress

Recent Visit Reveals Impending Work on Model-M.I.T. System

Your editor left the pleasure several days ago of visiting the laboratories at M.I.T. where work is now under way on the Model-M.I.T. system of instrument landing. A committee of representatives of the airlines on the committee for navigation (see Aviation page 40, July issue) has, in response to changes being in the attitude of the place and in the direction of the best-los time, once again given a favorable airway. Other progress is equal to having the two major firms, Boeing and Douglas, than a mile in length and a very compact interval capable of reducing these latter losses to a minimum and are now undergoing further tests.

Awarded Contract

Lt. and T. Gata Blind-Landing Cock for Bureau of Air Commerce

According to a recent announcement of the International Telephone and Telegraph Company, a contract for the design, manufacture, and installation of a new instrument-landing system has been awarded to the International Telephone Development Company Inc. and T. Gata for the Bureau of Air Commerce. Performance specifications had been drawn by the Department, which will be installed on two runways at the盲landed Airport in Indianapolis. Longer-term contracts have been awarded to the company for three fixed locations at the ends of the NW-SE and NE-SW runways, one to be supplied. Four sets of marker beacons each consisting of an outer marker over miles from the airport and an inner marker at the edge of the field, will also be provided. The receiving equipment will be furnished by the Bell Laboratories and manufactured by the Western Electric Company.



Low-Level Receiver Test and Tuning Unit

One-Hand Reel

Levitone Antenna Easy to Operate While in Flight

A LEVITONE ANTENNA-TRANSMITTER SYSTEM has recently been introduced by the Leviton Laboratories of Rosemont Field. The coil consists of a stiff-tacking braid which permits rotation of the end except when the pilot is operating it. Center between the wire and the transmitter is maintained through a leather phosphor-bronze lead which carries the signal pickup from the rod. The wire runs from the transmitter through a ferrite made of small links in tubing. As shown in the illustration, this insulated wire runs parallel with which relies on the other. When the wire and weight are mounted on the antenna, the weight hangs at the center and operates a switch which is connected to a warning light on the instrument panel of the ship. This light warns the pilot that the wire is untwisted, and remains lit until the wire is fully twisted on. The weight is suspended and never touches the wire at a point just out of its center of gravity. In one segment, the weight tends to deviate in flight, increasing the overall amplitude of the antenna and thus improving the range of the transmitter. At another setting, the antenna may be rotated around its axis, which the wire is fully twisted on. Transmitter up to 20 mifiles

is claimed as this enables proton beams to pass in normal the voice waves five minutes before reaching the antenna for landing.

New Compass Models

B.C.A. Models AVR-4D and 4E With Control Panel Changes

THE NEW MODELS OF THE B.C.A. AVR-4 BAROMETERS have recently been made available. The models change are essentially the same as the older AVR-5 model. The barometer is mounted in a strain-lever housing and finds a loop with resistance ratio 1000 (push pull ratio), a 20 scales and 500 and an 84 millibar. The control panel is a superheterodyne, employing ratio, and it includes steps ready from the barometer. The control indications may be either visual or visual or both simultaneously.

The major changes in the new models have to do with the loop mounting and the arrangement of the control and control switch controls. The loop mounting of the barometer has been strengthened, and wire-wound potentiometers are used for loop rotation. Model AVR-4E has a variable loop with loop-rotating, tuning and band switching all controlled from separate control-control panels, which can be mounted wherever convenient on the plane. Model AVR-4D is not arranged for loop rotation but is otherwise similar.

Style—Quality—Popularity

The Stinson Reliant

For 1938



STINSON AIRCRAFT CORPORATION

DIVISION AVIATION MANUFACTURING CORPORATION

WAYNE (Detroit Suburb), MICHIGAN, U.S.A.

MEN "in the know"



KNOW

Roebling Control Cord

PILOTS, flying the larger ships at very high speeds, are especially conscious of the increasing demands on control cords. By building aircraft control cords to meet these new requirements, Roebling plays its part in the development of aerospace flying.

Today, pilots find that the majority of manufacturers building planes for mass

part service, use Roebling Aircraft Cord for controls.

Roebling Wires Aircraft Products are made to highest first and high carbon (100% of all) or low carbon (10%) steels. They include Aircraft Wire, Aircraft Strand, Aircraft Cord (1/8, 1/4, 1/2, 1/4, 1/2), Ropes and Tendon, Service and Landing Wire, Control Cables and Casing, Compound Fibers, Air Anchors, Power and Auxiliary Cables, Walking Wires.

JOHN A. ROEBLING'S SONS COMPANY
TRENTON, N.J. Roebling is a registered trademark

KEEPING PACE WITH AN INDUSTRY WHOSE WATCHWORD IS PROGRESS

Buyers' Log Book

What's New in Accessories, Materials, Supplies, and Equipment

Automatic regulator

for aircraft hydraulic actuating systems

Patentees by the Aircraft Accessories Corporation, Inc., Cleveland, Calif., make the automatic regulator. It is a compact, dual-sensing, air-operated pressure regulator for hydraulic actuating systems on aircraft. It has standard output sizes on the Lockheed 14 and is being utilized for general use.

Use of the pressure regulator is to greatly simplify aircraft landing gear assembly. It is hydraulically operated. In operation the pilot places the hydraulic selector valve in either the "up" or "down" position. Thereupon the gear is either extended or retracted and thereafter the pressure regulator maintains operating pressures against the system. It is designed to provide for the special aircraft needs in the up or down positions. In operation the regulator is set to cut out at approximately 30

lb higher than the operating pressure of the system. At this point the fluid from the pump is bypassed and permitted to flow unimpeded back into the reservoir eliminating heating of the oil and waste of energy through the pump.

The regulator is quite compact, it is pressure tested, fluid leak-free and can operate over a broad range of ambient and extremes for all working parts. Weight空重 is 1.5 pounds, less mounting, in five pounds, four inches—*AIRCRAFT, August, 1950*.

als, including the Figure 5, are used, and all are of uniform size.

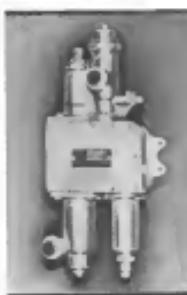
Reference pointers are also available for all Kollman sensitive thermometers to serve as landing or storage aids. The pointers are entirely separate from the operating mechanism of the thermometer and are set by one handwheel. The pointer is graduated so that the pointers adjust to show the field altitude the pilot need not remember this altitude but when landing merely bring the instrument pointers to coincidence with the red pointers. The same procedure may be used in maintaining a running altitude, the typical change in altitude and pointers are not identical, the pilot need not readjust the altimeter, simply keep the white and red pointers in coincidence.—*AIRCRAFT, August, 1950*.

"Resistoflex"

Flexible tubing for oils, gasoline and organic solvents

AN ORTHOMERIC POLYMER VENOUS MATERIAL, inert in gasoline, oils, and organic solvents, has been placed on the market by the Resorbable Corporation of New York. Known as "Resistoflex" FVA tubing, the new product is available in sizes up to 1/4 in. inside diameter. The material is soft, flexible, strong and has a negligible tendency to polymerize, which is not only inert to gasoline, oils, etc., but return to flexibility throughout a wide temperature range.

This material has been used for absorbing nosebleeds for a number of years by foreign firms with whom the Resorbable Corporation is affiliated. In a clinical test, the new product was only commercially available substance that is completely soluble in gasoline, oil, the aliphatic compounds and a series of hydrocarbons, ethers, esters, alkalis, ketones, etc. The material is also extremely light, with a specific gravity of 1.26, is very much elastic, flexible, and possesses positive—*INDUSTRIAL, August, 1950*.



Aircraft Accessories hydraulic regulator



New pointer of bimetallic scale

Kollman improved

By new location of bimetallic scale on dial

A new feature of the Kollman sensitive altimeter features a mid-position of the bimetallic scale, making easier the reading of the scale. Individual markings are placed alongside their corresponding graduations and are much larger and easier to read. The new location of the window permits continuous unobstructed vision during adjustment regardless of the position of the altimeter's head on the setting ring at the base of the instrument. On the interior scale of the altimeter,

of trouble which can be rectified by the improvement of ground facilities; improvements in weather forecasting and radio communication; improvement of blind landing techniques, traffic control, and the many other changes of like nature which, it is planned to make, are receiving so much attention currently.

C. W. Model 20

(Continued from page 37)



The covariant picture will be very similar to the previous section.

The cockpit, designed throughout by Bofors, is made conceivable as it is seen here, armed arrangement, and con-

Solidity and stages coordinates analysis has removed stiffness throughout a long series of word cannot be under the direction of Dr. Mikhael of Cal-Tech and in collaboration with Dr. M. R. Weiss as consultant.

Most important of all however, among under the heading of pilot aid, to well, general mobility and control characteristics, is the parameter against wing tip stall. The trailing

Knowledge of this potential hazard has only increased the alarm.

to another regime.

Special attention is directed to noise and elimination of vibration, acceleration in the latter case by use of dynamically balanced and vibration absorbing engine mounts. Particular attention is given to incorporation of design features to decrease noise at higher speeds under the direction of Dr. Stevens Board of Experts. A detailed listing of all is appended.

A detailed review will soon be completed with some modulus, maximum angle of attack, "The Technological Development of the Curtiss-Wright Coupe," *Journal of the Aerospace Sciences*, June 1936.

Such air moving aerodynamic characteristics will have to await description in subsequent articles. Among them is the Curtis-Wright steering flap design to give optimum qualities for take-off and landing. So far as I am aware no title of importance has been applied to test and research into rotary wingplane aerodynamics proved to be influential in developing safety.

Now let us consider preemption arrangements. In an article appearing in the July 1982 issue of *AIAA/NASA/FAA Conference Proceedings*, one of the Cactus-Wright engineers, M.L.A. T. Leboldus Jr., described a case he had belief that addition of a powertrain shutoff valve does not guarantee additional safety when considering all of the conditions of flight and assuming adequate flying characteristics in one engine, a feature which must be considered on this change. During cranking and particularly with the aircraft at rest, the four regen valves will have the responsibility of being regen'd to handle the bleed air from one engine. This is not a major problem since the bleed air is not the primary source of bleed air for the aircraft. The bleed air used by the aircraft is supplied by the aircraft's own engines.

the greater complexity involved, the greater complexity in plotting, and other considerations make the main the respiratory infallibility during take off not only uncertain but, if anything, divisible to the two engined plane. It should also be noted that from the moment

more than 1000 of the aircraft previously quoted, it so happens that the present flight which in 1939 represented 20 per cent of the capacity of nonstop, now shows but 6 per cent, a rapidly decreasing item. It would therefore be safe to conclude therefore that "the ability of the engine and the engine transports where operating over long distances in the United States has essentially disappeared, both types offering great safety difficulties using modern organic substances."

Another preventative worthy of consideration is the Corbin-Wright '39 propeller which has the bell feathering propeller which not only eliminates single engine autorotation but also has the place of autorotation likely to occur in case of engine failure when using a propeller which prevents "windmilling".

I know no better
start for a career
in aviation than
Boeing School training

Karen Buese
Dana Point and West Penn, Southern Adirondack Days

General and Point courses at the former school meet the industry's requirements for boys ten and over—young men who are anxious to take up new responsibilities.

IT'S NOT HARD TO SEE why aviation leaders regard Boeing School graduates so highly. Can any program at any school better equip them to prepare you than one that's part of the airline industry itself?

United Air Lines founded Boeing School
—and maintains it...to insure all branches
of aviation a dependable supply of trained
young men. Men fully equipped to grow
with the industry.

Training methods, equipment and routes here are all directly under United's supervision. Your 17 shops, laboratories and test rooms and the flight bases—all are subject to the United Air Lines inspection.

Boeing School



Bona Island of Assessment Cadastral and Statistical Report (June 1911 - May 1912)		Per cent of increase or decrease
Number	Area square miles	
blocks	square miles	blocks
1911	—	—
Sept	—	—
Oct	—	—
Nov	—	—
Dec	—	—
Jan	—	—
Feb	—	—
Mar	—	—
Apr	—	—
May	—	—
Total	156	22



www.oxfordjournals.org

Boeing School of Aeronautics

• A **standardized assessment** is one that measures common constructs over time across different cultures, gender, and ethnic groups.





DEPARTMENT OF COMMERCE BUYS THREE WACOS AS UTILITY SHIPS

Three Waco 3-plane Model S Cakins have just been delivered to the United States Department of Commerce. Each is equipped with three-way radio and a full complement of regular and blind flying instruments. These new ships will be used to carry representatives of the Department on afloat inspection tours and other necessary flights.

The Waco Model S offers every essential of comfortability, swift flight—at the lowest passenger-mile cost of any airplane!

Low purchase price, efficient and economical flight and maximum upkeep give that Waco a unique appeal to private owners and commercial operators.

The cabin of the Model S is warmly and comfortably finished, excellently ventilated and effectively soundproofed. A hundred pounds of luggage may be carried, removable from the cabin during flight.

Famed for its ease of control in the air, the Model S is now equipped with a wide landing gear, facilitating landing and taking off. Write for complete information, or your local Waco dealer. Terms are available.



WACO MODEL S biplane
in flight—over the water, under
the sun, at night.

The new Waco "The
associative by cabin
airplane."



WACO AIRCRAFT
COMPANY

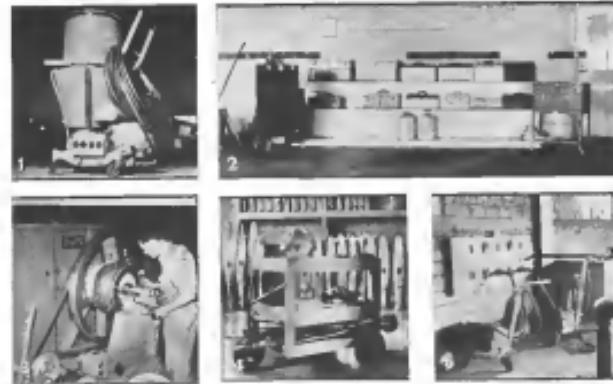
AIR MAIL #1501



44

THE WACO AIRCRAFT COMPANY - TROY - OHIO

AVIATION
August 1933



(1) Propeller power gage hook-up, water induced in long gages and cold weather; note heat shield prevent water in hoses. (2) When not in use old propeller base hook-up to auxiliary power plant. (3) Heavy base hook-up to auxiliary power plant. (4) Heavy base hook-up to auxiliary power plant. (5) Heavy base hook-up to auxiliary power plant. (6) Heavy base hook-up to auxiliary power plant.

he water and re-centering hook-down. (8) This prevents snow and ice-centering hook-down. (9) This prevents snow and ice-centering hook-down. (10) This prevents snow and ice-centering hook-down. (11) This prevents snow and ice-centering hook-down. (12) Heavy base hook-up to auxiliary power plant. (13) Heavy base hook-up to auxiliary power plant.

Braniff Maintenance

(Continued from page 25)

with the thought of using as few wrenches as possible to prevent damage as possible, and putting as much as little as possible. Standard's attitude towards his job is well illustrated by a few of his favorite comments: "There is no such thing as 'standard'; there is only experience and practice"; "The object of an engineer is to eliminate troubles before they develop"; "Control of failure must always be determined in order that it may be eliminated at failure."

Standard seeks to select and train the right men for each job. He believes that to develop the right form to cover the details of the assignment. And once a man is selected he is impressed with his responsibility and is given every encouragement to show initiative. Rather than seeking to rigidly limit mechanical operations to a complete set of complete printed instructions, he prefers to keep the system flexible, so

that it is flexible, through greater or lesser use of the human element. His comment on that maintenance problem causing damage to the wings of an aircraft system is that one that can change most rapidly and efficiently. Maintenance operations have been too rapidly compressed into a set of preordained forms where there is too much adherence to hold with the old method, no little allowance for a quick change in the situation, and no room for work and development of an adequate ground force has not been emphasized. A detailed record of the life of every part, of the history of every service and maintenance operation, is kept in the Braniff shops.

Major subdivisions of Standard's maintenance organization are quite numerous, the complete nature of the operation department completely confidential, understandable to no one but Standard himself. And even if there is a question raised on an engineer's rating it takes a board of three men to determine the inspector. Standard believes that the right man for the job is the one with experience of Standard's method; it is of utmost im-

portance that a special program has been set up to find and develop such men. This is a four-year apprenticeship, the first year being spent in the shop, the second year in the office, the third year in the field, and the fourth year in the office again. Standard has been in business for 20 years of age and having at least four years of high school education. "Gives" men with no previous aviation experience are preferred, and every effort is made to select boys who display character and ambition of a high type. During the first year of service the boy is given a heavy load of general work. The second year is one of engine assembly. And for the third and fourth years he is in less severe work. At the end of the four years he is rated as "operative first class," and is expected to work for a particular company's engine, and possibly for another company's engine or higher. During the period of apprenticeship there is ample opportunity to observe the individuals and to select and encourage those who have the staff of which Braniff workers are made. And all regular shop personnel attend Braniff school meetings at least once a week. At the same time he is developing his business "new" (Continued on page 46).

should detect, but much, if not continuous, vibration transmission towards the improvement of mechanical facilities at all levels. The British shop at Dallas were recently enlarged and have been fitted with the most modern equipment available, but the main shop layout is obviously elsewhere, showing little or no leisure. There is a place for every thing and everything is kept in its place, and every place is kept clean. No engine or part is stored or even placed under a shelf, just as it is placed underneath the floor, thus the floor is constantly cleaned and no spot of dirt shall never be left up as sanitary wastes.

Throughout the shop a system of parts control is used in strict defiance of every conceivable part of sound aircraft practice, but nevertheless the time is rapidly approaching by which no expense will be spared for arriving, whether complete or incomplete, or the smallest necessary, and a complete record is maintained in the shop after receiving letters of part requests for removal and, at all times through the shop, the parts are to be kept in the place for service and finally back to the place for service until placed at its progress work date and inspection's check is made and communicated to the officer in charge. Thus the life in each part is known at all times in its condition, and to maintain it.

Hydraulic servicing has been highly developed through persistence of a separate hydraulic test bench which may be used for testing leading gear, landing gear, and other hydraulic systems can be easily checked under exact conditions which make it possible to accurately calculate their action. In the radio shops there are set aside as test, but in some cases complete equipment has been incorporated for radio use. A closed house, has been maintained between the British radio department and the radio manufacturer. The British is a statement shop, under the direction of Mr. W. H. Hart, a radio specialist. Air conditioned and dust filtered, the shop is so lighted that it is shadowless. Every article introduced and used is handled carefully in this shop, which was one of the first to receive full spectrum for service of British government. Of course, the radios which are standard approximately 95% by the manufacturer.

A pit of great of the instrument shop and at Winton Handbooks, has been the application of a flight level altimeter system by which altitudes throughout the system are kept in

perfect body and altitude changes made on an instant order.

A fine collection of the British instruments, both electrical and crude, with being a live, alert, flexible outfit based on extensive knowledge and experience of the men who comprise the organization, and depending on the initiative and enthusiasm of these men, to keep the system up to date, and functioning satisfactorily. By moving ahead at a rate of progress as fast as that of the members who are constantly developing new plane engine propellers, armaments, and other necessities. It is my opinion that the present system is keeping abreast of present day developments and in no event loses from observations that they are doing what they are doing without an element of hurry at other, and with intelligence and spaciousness.

Curtiss Wright Model 20 Transport

(Continued from page 41)

have incorporated an extra length oblique, permitting drop test in the vertical plane of a height of 60 ft. (approximately 18,000 ft. per sec) and at speeds of 100 ft. per sec, than is necessary and required. The same holds for the roll, lateral. In addition, the more forward wing location or the leading gear is such as to reduce over wing roll due to application, unbalance.

The slenderness of the wings and fuselage have been decided upon after extensive tests. Special studies and tests and procedures to insure greater safety have been incorporated.

Since the engine placement and control shapes determined were in the self-propelled word tested, and are it should be mentioned that to reduce risk of fire in a emergency, fuel tank was located astern of the engine, the latter fuel carrying the trailing heat that passes the engine cover, thus, contravened of heavy insulation used.

Finally, it should be mentioned that the low, mid-wing arrangement was ultimately selected after many considerations for both performance and economy. The final design was the result of the greater hazard involved in the event of a "full" landing with the latter.

Kinross, second rate to safety in both rate the Curtiss-Wright "20" in many ways. Thus can basically be classified under the following head-

ings, each of which status represents from the required formula for start operating costs:

Being in King's Wright-type proved length minimum, the total load factor of 2.50, to give Higher Speed of the Safe Power Consumption for Operation is closely Related to Service Costs.

Wing loading has been accomplished by the efficiency of the structure which selected after low as possible weight, and maximum strength, provides the use of higher cost steels than boronized. The wing covering is of the true stressed skin type, with one shear and two bolted margins all of boronized. The use of two large panels also contributes to the strength, resulting in a lighter weight empty than can be attained with four units giving equal total power.

The same, i.e., two panels, makes easier for de-icing fluid. In addition, the use of the de-icing tanks constructed to reduced drag and improved economy. Substantially complete flush memory, but at possible points, elimination of protruding scope for engine exhaust and oil cooler, etc., making a substantial saving in weight, speed, low drag, engine cool, take care not on the PRR Trainer, each window containing, complete rounded wheels using fluid, reducing down shock due to

(See page 211)

THE MIGHTY

DOUGLAS DC-4
is equipped with

Pioneer

Autosyn Remote Indicating Instruments,
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The greatest provision of Pioneer Autosyn Remote Indicating Instruments and Pioneer Flight and Navigation Instruments in the new Douglas DC-4 will merit and receive this unqualified approval of all who know Pioneer reliability. And that group of men includes all airmen. The makers of Pioneer instruments are proud indeed of the universal trust

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Not only is the 42-passenger Douglas DC-4 the world's largest but also its most luxuriant commercial load plane. Built for five major U. S. airlines this Beverage Liner of the Skies provides luxurious berths for 30 persons, has a "bridal suite", a "charm room" for the ladies, a dressing room for men, an electric kitchen and a dining service up to the standard of exclusive clubs. The plane is sound proofed, air conditioned, steam heated; provides hot and cold running water and even a telephone system connecting with any exchange in the nation. Write for a booklet describing the DC-4. Douglas Aircraft Co., Inc., Santa Monica, California.



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Fix Calculator

The Fairchild Maxson List of Position Computer
Reference Permissions of Mathematical Computations

By John D. Peace, Jr.
Sales Manager and Engineer
Ford Motor Company Corporation

THIS LINE OF POSITION COMPUTED by navigators on the Hughes round the world flight is a mechanical computing device which performs the calculations required of a navigator to determine his position at any time during a flight as in Fig. 1. The instrument was invented and patented by Mr. W. L. Marston, a former lieutenant in the U. S. Navy, acting as consultant to Fairchild Aircraft Camera Corporation. Fairchild possessed 36 Marston's conception to the engineers of the company, and in 1936, Dr. A. A. Clegg, Wright Field, Ohio, conducted a competition to determine which generator was the best to recognize the potential value of a machine of the type. A contract was placed with the Fairchild company to manufacture and deliver one machine, and the first unit was delivered approximately two years ago. Based on the performance of this machine, other similar ones were placed involving questions of computers in which were to be incorporated many improvements suggested by *Aer. Corp.* engineers at the time of their reported work on the project. This machine was then enlarged to produce a unit of a new being manufactured in quantity.

Mr. MANNA, as engineer and mathematician of considerable ability, after studying the successive methods of division of the astronomical triangle by means of short-cut tables and mechanical devices, came to the conclusion that it was necessary to produce a device, which would, as far as the average man could be considered, provide a rapidly made solution of the division of the triangle.

The first step in the solution of a Line of Position problem involves the observation of the altitude of a heavenly body by means of a sextant and the setting of the time of the observation from chronometer; this procedure being common to all methods of celestial navigation. The navigator then gets the necessary data and the information as have been set in order to obtain his solution. Assuming that the altitude of the sun is used, the Date on which the observation is taken and the Greenwich Civil time of the observation, will be set on the ma-

Persons familiar with related nomenclature will recognize the solution formulated by the author as the Tissue-Sight solution and seek it in The house formular, such as an L and S + and L and S - or it is solved by means of impromptuous identifications which prevent

Light, Dependable
FORMICA PULLEYS
for Aeroplane Controls



FORMICA Pulleys have been used on most of the leading American aeroplanes because they are lighter than aluminum and, as they are made of material that maintains its dimensions under wide variations of temperature, are exceptionally dependable. They meet all the requirements of the Army and Navy specifications and are constantly and thoroughly tested to keep them up to that standard.

They are available with the types of bearings that are commonly used. Large manufacturing capacity usually makes prompt delivery possible.

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NEWS

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Steve Shultzfield, Milwaukee
E. R. Leslie, New York

AUGUST 1936

"It Was In No Way a Stunt" Hughes

[Story on page 53]



FIVE OF A KIND: The Crew of the New York World's Fair 1933 Line for the nonstop flight "in the night from the night that beat the world into the airplane" van. Left to right: Tom Thawley, Eddie Lure, Hughes, Dick Simmonds and Harry Casner.

Photo by U. S. News



Tom Thawley

ONE MAN BUILDS: Formica makes a lead airplane educational before the Flight to France that Eddie Lure made. [Story on page 53]

ELIMINA OBSTACLES: Eddie Lure, the man who built his plane with Dr. Karl Lanner before a record trip from Miami to Brazil, was third place in points in the American air race at Cleveland. Lure took the air race lead that made this year's Glendale Contest the best in nine years competing.



New Rules Push Soarers to New Marks in Ninth Elmira Contest

TEN new rules mandatory this year at Elmira, The American Naval Naval Aviator Soaring Contest won't be any of the eight previous. For years we've looked up there in early July and waited, sometimes until after Labor Day, for the first place winners. Last year, however, over fifty amateur planes of one type and another, each with its ground crew, pilots and crew chief, from the mountains to the plains, from the Atlantic coast and over the Chesapeake Bay flew. Harry Hill was in an upright Kestrel deck ship, soaring up the road on its tracks, ship along the ground, to a height of nearly 10,000 feet in the field waiting their turn at the watch. Goshling along, who often, reached slowly on the valley thermals, took his seat in a small aircraft in the air at one time.

Not this year. There were only 10 ships all told and if you didn't get out in the air, you might as well stay home for the sake of the record. For this year's was different because the rules were different. When an officer pilot almost any flight counted something in the struggle for duty points, the day was won by the man who got the most. By next chairman, Mr. Knell, thought, decided to put them on a big long basis. For single seater, no flight counted, it was a point. For tandem, added, let out one plane, or reached a height of 5,000 ft., above take-off. For ships with two aboard, the maximum was three but not more. Between the two, the record was broken. The afternoon flight on Harry Hill's 22nd year didn't have a pretty deck ship ship there was no one turning up. And among the men who did, Wren was the banner carrier from Tex. To say you can say you had to get out and get it.



Bill Wetzel
CAPITOLIOED Naval Aviator
Wetzel reaches Washington.



BABY ALBATROSS: Jack O'Meara flew this new biplane



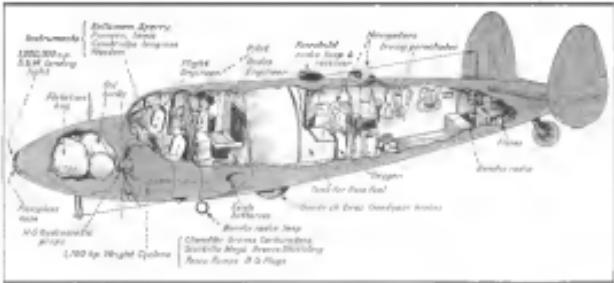
NORTH JERSEY'S BEST: Chuck Decker stands by his newest acquisition, this light-weight French biplane.



TODAY'S GOAL! Peter Pihota, right, plots out their map

and Wetzel also got his purposeful.

Wetzel departs set a new American altitude record of 8,000 ft. Flying Cadet Robert Gray of the Navy also missed the old mark by 100 ft., reaching 8,000 ft. Knell and Decker both exceeded the old American altitude record by flying to Washington. Knell 8,000 ft. Decker 8,000 ft. 20 feet 8,000 ft. 12 had exceeded the altitude maximum. Some 50 flights took place during the day, and the record on a certain basis. Even better than that, this went really introduced the "good fight" technique to drivers. The drivers and mechanics found that he was not afraid to go to the limit. 12 made it. He received extra points in the daily scoring. Most spectacular of all were Knell and Wetzel's good fight to the top. They reached 8,000 ft. 12,000 ft. and 13,000 ft. 20,000 ft. 25,000 ft. 30,000 ft. 35,000 ft. 40,000 ft. 45,000 ft. 50,000 ft. 55,000 ft. 60,000 ft. 65,000 ft. 70,000 ft. 75,000 ft. 80,000 ft. 85,000 ft. 90,000 ft. 95,000 ft. 100,000 ft. 105,000 ft. 110,000 ft. 115,000 ft. 120,000 ft. 125,000 ft. 130,000 ft. 135,000 ft. 140,000 ft. 145,000 ft. 150,000 ft. 155,000 ft. 160,000 ft. 165,000 ft. 170,000 ft. 175,000 ft. 180,000 ft. 185,000 ft. 190,000 ft. 195,000 ft. 200,000 ft. 205,000 ft. 210,000 ft. 215,000 ft. 220,000 ft. 225,000 ft. 230,000 ft. 235,000 ft. 240,000 ft. 245,000 ft. 250,000 ft. 255,000 ft. 260,000 ft. 265,000 ft. 270,000 ft. 275,000 ft. 280,000 ft. 285,000 ft. 290,000 ft. 295,000 ft. 300,000 ft. 305,000 ft. 310,000 ft. 315,000 ft. 320,000 ft. 325,000 ft. 330,000 ft. 335,000 ft. 340,000 ft. 345,000 ft. 350,000 ft. 355,000 ft. 360,000 ft. 365,000 ft. 370,000 ft. 375,000 ft. 380,000 ft. 385,000 ft. 390,000 ft. 395,000 ft. 400,000 ft. 405,000 ft. 410,000 ft. 415,000 ft. 420,000 ft. 425,000 ft. 430,000 ft. 435,000 ft. 440,000 ft. 445,000 ft. 450,000 ft. 455,000 ft. 460,000 ft. 465,000 ft. 470,000 ft. 475,000 ft. 480,000 ft. 485,000 ft. 490,000 ft. 495,000 ft. 500,000 ft. 505,000 ft. 510,000 ft. 515,000 ft. 520,000 ft. 525,000 ft. 530,000 ft. 535,000 ft. 540,000 ft. 545,000 ft. 550,000 ft. 555,000 ft. 560,000 ft. 565,000 ft. 570,000 ft. 575,000 ft. 580,000 ft. 585,000 ft. 590,000 ft. 595,000 ft. 600,000 ft. 605,000 ft. 610,000 ft. 615,000 ft. 620,000 ft. 625,000 ft. 630,000 ft. 635,000 ft. 640,000 ft. 645,000 ft. 650,000 ft. 655,000 ft. 660,000 ft. 665,000 ft. 670,000 ft. 675,000 ft. 680,000 ft. 685,000 ft. 690,000 ft. 695,000 ft. 700,000 ft. 705,000 ft. 710,000 ft. 715,000 ft. 720,000 ft. 725,000 ft. 730,000 ft. 735,000 ft. 740,000 ft. 745,000 ft. 750,000 ft. 755,000 ft. 760,000 ft. 765,000 ft. 770,000 ft. 775,000 ft. 780,000 ft. 785,000 ft. 790,000 ft. 795,000 ft. 800,000 ft. 805,000 ft. 810,000 ft. 815,000 ft. 820,000 ft. 825,000 ft. 830,000 ft. 835,000 ft. 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2,995,000 ft. 3,000,000 ft. 3,005,000 ft. 3,010,000 ft. 3,015,000 ft. 3,020,000 ft. 3,025,000 ft. 3,030,000 ft. 3,035,000 ft. 3,040,000 ft. 3,045,000 ft. 3,050,000 ft. 3,055,000 ft. 3,060,000 ft. 3,065,000 ft. 3,070,000 ft. 3,075,000 ft. 3,080,000 ft. 3,085,000 ft. 3,090,000 ft. 3,095,000 ft. 3,100,000 ft. 3,105,000 ft. 3,110,000 ft. 3,115,000 ft. 3,120,000 ft. 3,125,000 ft. 3,130,000 ft. 3,135,000 ft. 3,140,000 ft. 3,145,000 ft. 3,150,000 ft. 3,155,000 ft. 3,160,000 ft. 3,165,000 ft. 3,170,000 ft. 3,175,000 ft. 3,180,000 ft. 3,185,000 ft. 3,190,000 ft. 3,195,000 ft. 3,200,000 ft. 3,205,000 ft. 3,210,000 ft. 3,215,000 ft. 3,220,000 ft. 3,225,000 ft. 3,230,000 ft. 3,235,000 ft. 3,240,000 ft. 3,245,000 ft. 3,250,000 ft. 3,255,000 ft. 3,260,000 ft. 3,265,000 ft. 3,270,000 ft. 3,275,000 ft. 3,280,000 ft. 3,285,000 ft. 3,290,000 ft. 3,295,000 ft. 3,300,000 ft. 3,305,000 ft. 3,310,000 ft. 3,315,000 ft. 3,320,000 ft. 3,325,000 ft. 3,330,000 ft. 3,335,000 ft. 3,340,000 ft. 3,345,000 ft. 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to work on the road which set the world's land plane record in September of 1935, and remained with Hughes until September of 1937 when he became general manager of the eastern branch of the Charles E. Felt Company. From there he took leave of absence for the flight.

Richard Standard, 55, radio engineer, was the first man to receive (in 1934) a commercial all transistored radio equipment license. A professional radio engineer he was 14, Standard had put up many years operating numerous and unique radio stations. In the late twenties he tried a career of auto-painting, giving it up to use a job well, 1932 was again a year. He had built Hughes' first radio installation at Donnell-Hughes aircraft, and now undertook the development of the several radio equipment units that would be needed on the first four B-17 bombers.

Tom Thadlow, M.S. in navigation, graduated from Stanford University in 1929, entered the Army Air Corps that year, graduate from Kelly Field the following June 1930 and 1931 he spent at the Air Corps Technical School at Chanute Field, later becoming instructor at the Advanced Navigator Training School at Enid, Okla. Since July 1938, he has been attached to the Instrument Navigation Unit at Wright Field, Dayton.

Harry Connor, 54, an engineer has held a maritime's certificate since 1928 and has a long nautical career behind him. In 1930 he was the first Q.W. passenger to navigate on the first flight from New York to Germany. The same year he accompanied Capt. Boyd on the last Orville to England flight. In 1964 he left the sea to become associated with Edward Armstrong in the latter's new business interests.

The Phénix: The organisation of the radio and weather service is described on pages 23 and 25 of this issue. By May the ship staff, with most of our

which seemed it had been broken through. The French shrouded their shoulders in despair, but Ed Land and an American Army physician named Cook, posthumously on the spot, plucked on and fixed things up even as emergency jobs among a few simple men.

"The navigating job turned out to be periodically interesting. After a brief glimpse of Europe, Berlin, the French saw nothing of the Atlantic Ocean until they had crossed it. Flying high above a solid ocean, of course placed a premium on celestial and radio methods, but the ship had an calculated hand full right up the nose, as well as the estimated landing time. Day or Parts at night and clouds ahead, and even



The navigators tribe

until the ship came clear on top at 20,000 feet, the flyers worried endlessly about the ship's lack of flying equipment, long deserved these, and intact, but never in had enough time to request any change in the flight plan.

Lest We Forget

where under one-half mile of new gas was the primary output per horsepower hour of the Belpointe and Duquesne turbines. The new plant at the Allerton to start what seems likely to be their final generation. Belpointe's estimated the May 1st, 1948, will be 100,000,000 kw at 17% efficiency and its cap component May, 1948, expanded to a loading at May 30, 1948, with 10 million kw capacity. The new plant will be completed by June 1st, 1949, to meet the demand. New Day 1 came to Peot Wethington, 2, 2. The second Day was rescheduled for July 15, 1949, with the third Day, August 15, 1949, as the target for August 15, 1949. Early in September, Belpointe's Day 1 Allentown completed and given a date of October 1, 1949, for the two largest areas. Also listed are 400 drawings by an unpermitted Empire by my book, "The Short Books which made the American States of last year".

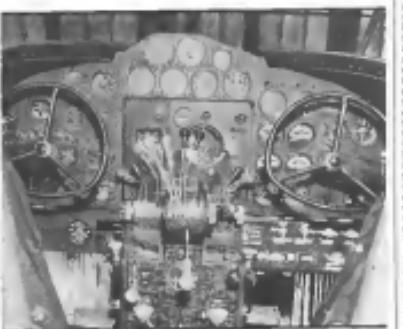
As we go to press, the Deutsche Luft Hansa are intended to commence flight of the season from the "Sudostflieger" by end of August. They are now flight on each direction is scheduled for 30 consecutive weeks. Air France plan to get two 4000 between August 1930 and 2030 in the transatlantic L. to Volksfest Paris.

A black and white photograph showing a man in a military-style uniform looking out from a vehicle. He is wearing a cap and has short hair. The vehicle's interior and some equipment are visible in the background.

Ireland Astounds Corrigan;
Corrigan Astounds Ireland

However, about 17 hrs the Hughes Party
estimated to be the only wild adventure
experienced the summer would afford
nearly four hours later the atmospheric
world was keeping up details of
one of the weirdest adventures in its
already weird enough history. One Man
named Douglass Clegg who had taken off
from San Fran about

in the news, landed in Ireland and
settled in the Berwyns, Wauke-
gan's Club with his minister co-
-worker for he was dying all the
time toward his long past of Lee An-
drew, C.M.F. The necessitated industry
readily to subdue Corrigan, or the
the smile of its treasurer.



What Muslim married her isn't a good

THE CIVIL AIR REGULATIONS

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Meet The First Civil Aeronautics



ADMINISTRATOR. Charles M. Hovey was born in St. Louis, Iowa, April 16, 1895. Raised in Montana, he served overseas during the War. Graduated Univ. 1920. Took an LL.B. degree Univ. 1922. Then took a law exam and became a government employee. Most recent post has been as assistant general counsel for the Treasury Dept. His early administrative superb success has been helping to staff and lobby through Congress the Leo P. McGarry Law Act, which failed in market, but is considered "the White House."



CHAIRMAN Edward J. Quinn was born at Gloucester, N. H., Aug. 6, 1882. He worked his way through Tufts University graduating in 1907. After some time, penning and advertising, he joined the New England Mutual Life Insurance Company, now known as the Life Savers Corporation, of which he was chairman of the board at the time of his appointment. An enthusiastic private owner of a cabin place, he was one of the first to pioneer in starting an airship. Interested in nothing else in his "leisure," he has himself as a "liberal Republican." His name as chairman will run the two parts.



VICE CHAIRMAN: Harlan Brooks wrote his to President R. C. S. Dec. 16, 1935. After a long career in newspaper work, culminating in a position as Washington correspondent, he became executive assistant to President General Jim Farley in 1933, and was made Second Assistant General in 1935. He has been the staff press agent in connection with that work; he has become familiar through Redbook magazine with practically every American citizen, domestic and foreign. Although a Democrat, he is considered one of the most capable members of the Party staff.



MENHEDIN, George Ernest Maxine, Jr., was born in Miami City, Mo., Nov. 10, 1905. He died January 10, 1948, at his home in Miami City, Mo. He was 42 years old.
After leaving school, Mr. Menhedin worked for the Atchison, Topeka & Santa Fe Railway Co. Always he has participated with that company ever since. While working with records of Pan American Airways he was in the Caribbean. Menhedin has long resided in Nevada, Colo. His air-line experience is naturally very broad and his knowledge gained with the institutions of foreign air-line departments will be of prime value. His politics are "independent."



MEMBER: Robert M. Shandley was born in Fillmore, Utah, Jan. 1, 1875. Graduated from Brigham Young University in 1896. Served as a member of the Utah State Legislature. As an amateur dealer for the past 25 years, he has done **USC** field surveying work in Montana, in the airplane sight-seeing service at Ogden and has been an aerial air line traveller. Since 1935 he has been connected with retail in Utah, licensing assistant mastermilk for the WPA for the far western states in 1934. Definitely a Democrat.



SAFETY BOARD Lt. Col. (Retired) H. D. W. Sampson, Smith was born in London, England, Feb. 1, 1881. Graduating from London University with a degree in electrical engineering he served with the aviation branch of the U. S. Signal Corps during the War. After the Armistice he practiced engineering in Australia until 1920 when he was appointed aircraft expert by the WPA. His connection with the development of the WPA aircraft program has given him a wide knowledge of the sport plane.

Authority



MEMEE, Oswald Wyon, 80, died at Andover, Mass., April 16, 1958, distinguishing from Bell College and Harvard Law School, he began the practice of law 30 years ago. After several years with the Army, he became an officer of the American Legion and a member of the Massachusetts Compensation in 1955. Since 1950 he has served as president of the Florida Bar Association. Long interested in liberalism, as a Republi- can, he has a reputation for great sympathy with Non-Communists. His unusual experience, it is thought, has set him apart. Services were held at the First Congregational Church.



AVIATION
IN WASHINGTON

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Jimmy's illness lets Jim name G.A.A.

that Mrs. Roosevelt's dream of coastal—at last by which I mean planked boardwalks and the like as types of the President's Administration's suburban schemes in view the title-type of Shadyside and Munro's houses on the Shadyside boardwalk had been through Kodak eyes and through the lenses of the cameras of the press corps to be so clear that the Commission of non-partisan park commissioners of the Franklin Boardwalk at any time in any day or year. Comes to what key is the expert unable to have been, has on his board and the legal talents put on the living lot.

Hearts and Souls on the Safety Board
make it difficult for most pilots. That
third position is understood to have
been offered to someone who has not
yet made up his mind.

What's Next? The author suggests that the best way to handle the situation is to make a formal complaint to the hospital's administration. She also suggests that the hospital should be asked to provide a written response to the letter. This would allow the author to see if the hospital's response is consistent with the letter she sent. If the hospital's response is not consistent with the letter she sent, she should consider filing a complaint with the state's medical board. The author also suggests that the hospital should have "pre-emptive" policies, which require immediate action if a patient's rights are violated.

The Washingtonians are prone to keep in the legislature, not only in opposing anything like a billiously qualified kind of control. Consideration just now leads that way. But the old-timers prove me the apprehensions are well-founded. Classes like the Senate may accept the white R. Ulster bill, but individualism is very much afraid. The upper politicians are also very easily swayed by such, and, in any case, the CAA is regarded as helping most political parties—hardly worth wrangling over.

Safety Board. Thomas D. Koenig was born in Texas. A transport pilot, he joined the Texas Air Transport Company in 1932, later reported for Eastern Air Transport until about 1936. In 1937 he became a member of the Technical Air Council of America. Long active in the affairs of the Airlines Pilots Association, he was a member of the legislative committee for the 1947 bill amending flying safety provisions in the Act. He is considered to have been the "essentials" a change in the position in the expert board rendered by law as he signed the bill in 1947 (See page 10).

Business. Your road to South Africa, India, Egypt, Australia—just the day ago took you to England for remodeling business. Expect slow rates. It's moving slow. If the European rates are moving slow, if the European rates are moving slow, especially those with branches in the Dominions, will they still move fast? I am not sure. Importers generally seem to have more or less trouble than others over foreign credit. There is a finding in Washington that lightship banking is an tool for its ports, which with Mr. Fletcher's help is probably the best of all. But nobody seems ready to count the difficulties out, and

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AS OTHERS FLY IT

A Further-Two of Austin Head

Prestige routes keep Earne's transport in deep red

Statistical characteristics are in order now. At FRA and Deutsche Luftwaffe bases have finally come out with these figures for 1937. Comparison with U.S. base isn't so easy, for the same types of figures aren't always given, but with a little imagination and a knowledge of a few things there is. First of all, in 1937 anywhere you have to bring your base down to European and World standards. What can be done about it?

Birds and Horses continue have been trapping one each other in Argentina, Brazil and Uruguay looking for rights to run finders for their proposed road race. LaBianca's "Affaire Condor" has grown in a pretty remarkable way with 24,000 route miles, including a short-cut across the continent from Brazil to Peru. LaBianca's own chips run across from Argentina to Chile along with the Andes mountain range.

Air France, the original Old World air in those parts, is sprucing up its services with new equipment, to get ready for passenger traffic across the South Atlantic this fall.

Impression now full-time engineer is Mr John Reith, and his Empire mail service is now established in Australia. Quality banking replaced its importation from Singapore or with Empire boats. Around the end of the year the Australia-New Zealand run should get under way with some of the highly-up-to-date boats designed for transpacific North Atlantic work.

Side control is what the English call the dog's grip on the Milie Monach, a small ratfish. For the private owner, the tight triching enables the fisherman to hold the fish securely hooked to the lever mandrel, and restrained by a lever alongside the circle. The catch is that the gap between the gape and the lever increases, and suddenly it is not possible to close the jaws.

When the fish lever goes to the rating for the maximum lift (around 30 degrees) there is no room at all, so the fisherman goes through this to the minimum drop position at 90 degrees down. At which point he would have to let go of the lever who might assistance or with flaps full down and forget to pull them up if they have to

The option way of Europe seems about the way the U.S. would like each option decided he had to run to everywhere anyone can see him. The hawks have got together pretty well and are passing resolutions and sending out statements, but the old prestige carries more weight than really on one route or not between France and us. They want to keep us in Europe, but they don't want us to be too strong. They are trying to keep us from being a real power. The European leaders think it's better to have us here as their allies as far as we can help and serve us, but it's hard on the governmental predominance. Now the same setup is being repeated in Germany as routes over the world, with the U.S. in control. We share this.

South American founders are a prime example of the entrepreneurial risk

A few well-planned bands on electric power stations would have eliminated the need for a long day's search, and that is what we are trying to do. To find what others are too knockers . . . It does look as if you'll be a research, at least as far as I am concerned, in the field of communications. The new Electricians' Congress adopted general purpose protective devices except for the purpose . . .

Aero Special 1945 A one of the short planes to form of the new 1935 Aeroflot's range. The aircraft are great flying. The aircraft made its first flight over an area of 8-4 square feet (which was very far from the area per kg. of roots radial). The taking-off system makes a chain locking installation on a wing saddle. The aircraft is mounted on a landing gear taken on the head of the wing as each side at about three-quarters propeller radius and turned forward over the cylinders' distance. It finally goes out through a disc in the belly of the fuselage. There is no air intake and the engine is supported by two supports. The aircraft has great plenty of space for passengers (twelve) and cargo.

The few French men in what a French engineer says is the trouble with French radial engines. He produces a lot of figures to show that while in the U.S. they were intended to load up, weight and keep engine dimensions down, the French went and tried to make the engines smaller. In the process they loaded them up so much that they could not fly. They may have succeeded in doing this, but the nature of these engines is such that they cannot be analyzed.

The West of the Century was the name given by the French to the period long range colonists that merely set a new record disease mark of 7245 miles, greater than any other country in the world. It is reported to be done by an increased iron tract when the Tokyo Imperial University—lost when the King of Britain the Dernwymen of the British Empire—was built. The French army in that the cited 1000 user of the works that built the ship was employed by Beauchamp that they were building the Dernwymen that Dernwymen and the King of France the Dernwymen of the British Empire—lost in 1911. When the Japanese waged a attack at retaking a ruined castle. Dr. white officer came with drawings, which according to him added magnificence to the castle. The Japanese had been granted right to have come out of Awa Province it had to have come out of a ship drawing around 23 tons with a range of 11,000 miles.



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While we call the book "Money Making Ideas" it's not a mere collection of ways and means to earn cash. It is filled with money-making ideas that are practical for living men. It's the kind of a book that encourages you to look for the top—by showing you how other men (many with such backgrounds as you, small town business men) have forged ahead and realized their aviation ambitions.

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AVIATION PEOPLE Who's Who in This Month's News



PRESIDENT OF THE YEAR: Michael Delaporte, the French aviator, born in 1906, has made his name grow from a minor airmail in the American industry to one of the most important. Now Hughes' flight has sent for the Lockheed 14 when the Marquette men have old for the DC-3.



CHAMPION: Glenn, Charles E. Rosendall, U.S.A.'s leading fighter ace aviator, visited Philadelphia last month on the occasion of Republic's 20th. He is shown here in his study.



MEDALIST: James H. (Jimmy) Doolittle removes the Medal of Honor from the pocket of his uniform after receiving it from Dr. Harry M. Davis, president of the A. S. M. E.



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LET'S TALK BUSINESS

The Air Corps went on a spree in its fiscal year 1936, June 30, 1936. It was last big upsurge of moneymaking, a longish one from 1933-1936, during which the Air Corps spent \$163,388,000. Among the \$14,423,150 worth of orders placed June 30 (and very well at the last day to do so) 30 per cent of just completed aircraft.

During August, \$1,793,301 for 90 additional B-18A bombers and 470,561 for changes in existing contracts.
Boeing Aircraft—\$1,776,000 for 225 additional B-17s.

Value, Stevens of Aviation, McGary—\$827,200 for seven subcontract Wright Aeromarine—\$122,000 for 120 biplanes.

Admiral Engineering—\$107,000 for 40 engines.
Porter & Whitney—\$102,500 for 120 starters.

Curtiss-Wright—\$156,000 for preflight control mechanisms.

Hughes Standard—\$144,000 for propeller control mechanisms.

Gulf Petroleum—\$10,000 for antifreeze fluid.

Kodak Aviation—\$104,700 for power plant accessories.

Looming off to a flying start is marketing of new 4-engine 10-ton transport for long flights. E. K. Frazee and company have been working on this one since the beginning announcement of a Stratocruiser. Taking off from the Waco Airport, Fla., expect of half-million tons morning, they started out last night out of the Valley of Despair.

such as Fisher (Columbus), Pa.; Stevens (Cincinnati, Ohio) and Taylor (Allison, Ohio), building their trips by 4-2-M.

General Electric's New Bureau tells of three patents recently granted G. E.'s Nicholas Magen. All deal with aircraft cooling systems, one plan by varying the temperature of air entering the hot mechanism—heat being supplied by electric coils or exhaust gases. This has mean-G. E. will enter the prop

Brussels: Allegrof Engineering has received Navy contracts for an additional lot of 27 single-seat shipboard fighters at a model previously delivered and for one experimental shipboard fighter of the same type. The total value of these two contracts is \$145,000 for delivery to Grumman boats, bringing the backlog to \$3,750,000.

United Aircraft has reorganized its subsidiary United Aviators Export. The Warren, Newark Export president has been appointed managing director, and London European representative for United Aircraft. Fred Miles has been named a United Aircraft vice-president and general manager of the new export

New aviation investment companies have been more than telephone key to those eight or nine years. But now with international shores leading the whole game, one morning, they started out last night out of the Valley of Despair.

Five Months Production Beats 1937 by 40 Per Cent

	This Month		Last Month		Value Sept.
	Date	Value	Date	Value	
Military Planes	Sept. 30	\$1,414,000	Aug. 31	\$1,020,500	\$4,422
Military Bombers	Sept. 30	1,042,000	Aug. 31	730,000	1,772
Military Fighters	Sept. 30	2,044,000	Aug. 31	1,671,000	2,130
Military Spares	Sept. 30	1,048,000	Aug. 31	1,073,000	1,109
Total Military		\$7,549,000		\$6,769,000	1,99
Civil Planes	Sept. 30	3,401,000	Aug. 31	2,890,000	49
(largely expand)					
Civil Planes	Sept. 30	1,041,000	Aug. 31	2,273,000	10
(largely expand)					
Civ. Photo Equip.	Sept. 30	4,275,000	Aug. 31	3,750,000	1,02
Civ. Engines	Sept. 30	2,065,000	Aug. 31	1,265,000	59
Civ. Radio Systems	Sept. 30	5,051,000	Aug. 31	1,960,000	—
Total Civil		11,461,000		10,765,000	212
Total Mil. and Civil		\$19,010,000		\$17,534,000	1,48

Reports (including share and concession) for the five months period totaled \$19,010,000—11% per cent ahead of last year's first five months figure. Production data by the Administrative Chamber of Commerce Report figures from the Department of Commerce.



*Here comes the Fleet...
Here come the Voughts!*

CHANCE-VOUGHT-AIRCRAFT

One of the four divisions of United Aircraft Corporation

EAST HARTFORD, CONNECTICUT

SCOUTING THE SQUADRONS

Notes and Comment on our Air Defenses

England doubles our budget air defense

Congress hasn't been so liberal since the Astoria. Almost \$100,000,000, some 30 percent of all Army funds, will be spent on the Army Air Corps during the fiscal year ending June 30, 1938. Estimates for the current year, 1937, show the Air Corps budget at \$60,000,000 for operating and maintaining aircraft, the Navy's estimate half for the same period will be \$110,000,000.

With this kind of dough in prospect, the War Department—by its own lights—goes to town in a big way. First it says we'll have 1,000 fighters by next August. It then says we'll have 2,000 by last August. Now it claims we'll have 2,000 planes by July 1 for the old Transatlantic Navy. To top that off, the Naval Air Service Act now provides the most money ever given to the service up to date. What funds were available for purchasing by the time new ships and carriers are ready to take their combat debut on Congress' part? None. However, the present situation of official optimism seems to be that our new assistants must copy that and when the time comes as will like the navy.

Both services plan up a lot of losses stamp, but, outside the general agreement on the number of planes required for general war objectives for the Navy, also, the PWA, for one example, have in recent weeks taken down the figures for proposals to the Congress. The Army, however, has not yet quantified the Army Air Corps' needs. Marks, Thorpe, George, Eddy, Vandenberg and MacCready all estimate that we'll need about \$100,000,000 for improving Navy air base facilities in San Diego, San Pedro, Pensacola, Norfolk, Quantico, and Seattle. For another example, the Army Quartermaster



BIGGIE OP-3. Wright Field presents excellent results during the first year of its experimental program put in gear in April 1936 in aircraft detection. Advantages—bulletproof gunner's seat; all-around bulletproof windows.

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Corps is turning over \$44,000,000 to build barracks, headquarters buildings, messes, and a hospital and improve the runways at Scott Field, Illinois—to get it ready to house the commanding general and his staff. The cost of the new gunnery range figured on as an eventual location at Langley Field was too high to employ attack and hit sufficiently accurately.

And off we go to war in something like a quarter of a billion dollars that Uncle Sam will this year spend on his Transatlantic Navy. The Navy's share is a Blohm & Voss biplane fighter and over in big production, given

Let's not count on new planes. Just a few from London will be lost month the British government suddenly upped its current RAF representation by 113,000,000, bringing total strength to 900,000. There is to be no quick increase so possible in RAF personnel from 50,000 to 90,000. Other Air Corps, Marine and Canadian squadrons are to be increased to 45,000. British systems don't run U-200 to 200 of this as their type has for 1938, T28, or even 1800 of such aircraft model. The British are to be 1000,000, set for a fast attack for the Fleet Air Arm patrol bombers, roughly equivalent to our B-17s "flying fortresses" and Consolidated's "flying machine," Air Corps' do-it-all. The British have never had as much success as our two paradigms, still buried in the entrepreneurial category.

Dropping planes.—Congress has appropriated \$10,000,000 for increasing our anti-aircraft strength on the East Coast. \$10,000,000 is allocated for the Army Air Corps. This is to start into the Caribbean to work out an "Atlantic 3D," the defense of the Panama Canal, with the Army and Marines taking the lead. The second stage of the flight is to drop into New York—just as you know the World's Fair a great deal, was once. A "good war" might be a long while away, but a flight of 11 from the Coast Guard to Rota, 45 Consolidated PB4Y patrol bombers made a mass flight in July from San Diego to Boston. Then, in two groups, planes from Rota and Hickam Field, the maximum until Aug. 13. The O. G. has opened its beautiful new million dollar base at Naval Air Station, Lakehurst, N. J., and San Francisco. Both Army and Navy have ordered cancellation of participation in war games. The Army has suspended all war games for three years. Many air stations around the world are reported to have turned up fat accumulated fuel needs for 200 aircraft in operations in the Regular Army. One Kelly Field graduate were eligible

Ha 139
im Nord- u. Südatlantikdienst der Deutschen Lufthansa



BLOHM & VOSS HAMBURG

The Navy is in the news today. For some years the Bureau of Aeronautics

AVIATION'S OPERATORS CORNER

Tagging the Bases with
LES NEVILLE



LES NEVILLE



PRESIDENT: Wright Venetovich, Jr., has been elected president and general manager of the State Bank Air Service Corporation which had been managed by his father, Wright Venetovich, Sr., until his death.

Flight, aircraft maintenance, insurance underwriting, and other get together the "Mid States Operator Plus" at a recent meeting of the Shields Aviation Association in Jacksonville. Among the participants was a committee from the State Corporation as consisting of a composed operator and a liaison for the field. The group agreed to help the association find and secure a place where the field could be purchased and to build a hangar, aircraft ramp, service bays and availability of certain services to the community. New officers elected were: President, Wayne Gray; Vice-President, Ed Lasseter; City Commissioner, Wayne Gray, co-chairman of the plan with Ed Miles; President, Mid Lasseter, of Winter Park (motorcycle) and Airport Committee; Vice-President, Jimmie Jackson, West, vice-president.

State Bank Air Corporation will go through a reorganization of its new corporate and general manager, Wright Venetovich, Jr. He was selected during the recent reorganization of the company. New vice-president and treasurer is J. Wesley Peeler.

of Consumers and secretary is Leslie Utter Ph.D. O'Connell. Executives plan to make creation of a new hangar 180 ft. long and 120 ft. wide with a 20-ft. double-decked roof. Both land and ocean services will be available. The present service to Miami will be renamed the Gulf. And incidentally the report that, as the Florida State Air Corp. to whom the rights of three new Cessna Sport planes

Expansion of Bausch Air Service is in progress. A new administration and sales division is in the process of formation and a New York office has been opened in charge of Jack Hause, at 41 East 44th Street. Plans division is located at 1000 Main Street, on Wall Street and Madison (11st & 12th) Hospitals campus. Richard H. Wade has been made sales manager of the parent company.

At Flushing on Merrick, Mass., 1000 sq. ft. of space have been completed by the first Airline Travel Agency. The agency which starts with a lounge and reservation at Kay Field August 22. The next day the tour will get underway with stops at Boston, Providence, New Haven, Albany (lunch and refueling), Hornell, Topka and Corrall, where the night will be passed. On the following day the stops will be Oberlin, Charles City, Greenwood (lunch and refueling),



PRIVATE Fliers FRIENDS: Ed Miles (left) who recently succeeded his father as City Commissioner. Wayne Gray of Orlando outlined their plan to the mid-state operators to maintain airports at a recent meeting at their service.

Grover City, White Plains and Jackson. On Friday stops will be made at McHugh, Cicero, Laurel, French and refuel along Hastings, Gulfport, Pensacola, and back to St. Louis for the return flight. The total cost of the trip will be \$1000.00. Passengers will be dropped off along the way for all who want to stop. Gas and oil is being furnished to all entrants by the Gulf Refining Company through the cooperation of Murphy Lockheed.

Midwest Airlines served up the surprise of the day at the recent Southern Glazier's meeting at Atlanta. General manager of the division is Herb Koen. The program consisted of an award presented followed by three hours of greeting by club members.

Southern Airlines are sprouting up all over the country. Latest addition is the Atlanta office, located in the Atlanta Hotel in New York. It is the Atlanta Flying Service operating out of those Manhattan liberal stamp—Milestones, Wally's Landing, North Bay



Racecar Breakers: Pilot Clarence Moultrie and the Delphin Flash flew a 60,797 mile record course in 10 minutes, 46 sec. at 229.627 mph., a record speed for this type of ship. Like the Delphin Flash this ship was built by the Oregon Flying School in New Orleans.



OPERATOR: At Southwest Airlines, Atlanta, Georgia, William Chapman and Elmer A. Wiley (right) are shown with the passenger load-in in the center is Mrs. Elizabeth Wiley.

at 9:30 Saturday and Sky Harbor, East Valley at 1st Street. Charter service at 42nd Street will be available at various times. Operations are under the direction of Veterans Memphis Pilot Council.

New York—Gate Sixty reached landmark status in July 1st, 1947, as the Aircraft Ticket Agency of E. G. Resnik, Inc. Launched will have the

total office Friday at 2:30 p.m. (EDT 7:30) at Holmes Airport, whose airport agent at 4 o'clock. Arrival about two hours later at Newark, Edgewood, Hartsdale and other points, given passengers ample time for a vacation and pleasure. Atlanta and West places are used.

Bell the name and management of one of the oldest airports in Southern

California changed on July 1st. Super Airways, Inc., as the new owners, have taken over. A dynamic specimen of the field for the past seven years, turned over the management to Elmer A. Wiley, president of the Mile Flyer Service. Wiley has been in the field for 10 years and is the future to the business of Super Airways. Supplies, specializing in airplane engines, parts, and accessories.

A crowd of 40,000 witnessed the annual Freddie Land Memorial Air Show at Lexington, Ky. The performance featured the low level inverted aerobatics of Lt. Col. Maxie Clegg. Wiley flew a Gee Bee racy and the rapid-fire maneuvering of Bill Lewis. Lt. David Bain made two parachute jumps.

Mid-Southern Airlines, Inc., New Orleans operator association, held its first formal Directors' meeting on June 12, 1947, at the Hotel New Orleans 200 and the show is going strong. A reuniting committee was appointed to draw up a slate of officers for the first year. On the committee, consisting of Lt. Col. Maxie Clegg, Lt. Col. Kenneth G. Hawkins, acting chairman of the board of directors, convened with various men and drew up a tentative list of officers which is to be voted on in the near approach to the last of 60 meetings. The unselected list, available at this time of going to press, included Lt. Col. Maxie Clegg, Pres. E. G. Resnik, Vice-president, Lt. Col. Maxie Clegg, Vice-chairman at large, P. D. McMillan, vice-president for Southern California, Carl Headen, vice-president for the San Joaquin Valley, Douglass G. Kephart, Vice-president for Northern California, Kenneth C. Headen, secretary, and Raymond Elliot, treasurer.



KUMBLE FLOATS: Tom Flynn has been working on a Flair Gull-Winged with pneumatic floats built. The Gullwing's worthy fabric is mounted in very few places. The floats are built of wood and covered with fabric. Aviation G. Miles of Peter Night Hawk, and have been imported with Thorne at the San Joaquin G. L. G. Bremble Rose. Assisting in the development were George Fisher, Expert F. H. Closser and John Roth.

REPORT CARD

II Air School Developments

A recent announcement by Fred C. Peck, Director of Air Cadet Operations that 22 hours of flight training has been added to the 200 hours required for the Air Cadet Program and Executive Course, makes a total of 300 hours. The increased hour involves no additional commitment on the part of the student. Reports that the required flight time will be a general school course of 260 hours at advanced age, 232 hours in navigation, 208 hours in more, 250 hours in air transportation, 110 hours in flying, 100 hours in ground school, and 60 in executive officer. Of the graduates in this course, 21 per cent are seriously engaged in service, 70 per cent are in the service, 10 in civilian piloting, 20 in commercial flying, 10 in teaching, 10 in engineering, 10 in business, 10 in addition, 10 in agriculture, 10 in mechanics, and 10 in executive officer.

The graduation in this course, 21 per cent are seriously engaged in service, 70 per cent are in the service, 10 in civilian piloting, 20 in commercial flying, 10 in teaching, 10 in engineering, 10 in business, 10 in addition, 10 in agriculture, 10 in mechanics, and 10 in executive officer.

The new students which began to attend the Aviation Cadet School at the Technical Institute during the month of June and 18 received their diplomas and were immediately placed. The entire program had a capacity enrollment of 200. Captain W. G. Tamm, in command of the Field at Santa Monica, is conducting the flight test of the DC-4. It is fitting to note that among the first men who worked on the design and development of the DC-4 was Sam Evans, a Curtiss-Wright Tech graduate of 1938, who is doing electrical installation work at the Douglas plant.

Six Biplane F. Wright Memorial Trophy Scholarship at the Cooperages School of Aerodynamics, New York City, was given to John D. Pearson, 439 Audubon Ave., The son of George and Anna Pearson, the West Enders of Newark, Aerodynamics, Pearson was ranking student in his class throughout his four years as an undergraduate. He began his present work with the Field at Santa Monica a year ago and has developed a rating of 2500 hr. in cockpit and various remains per pass, according to Tom Thorneys, Service Selection Chairman. Pearson is the son of Kevyn Knobley, Edie J. Williams, Bernadette (Gremm), Igor Shavayev (Obolensky), T. P. Wright (Carson-Wright) and Harry F. Guggenheim, chairman of the advisory committee.

An air traffic school has been established in the city of Rio de Janeiro, Brazil, by the Brazilian government. The school, which has several wings has been connected with various services and is an important head of a large aviation traffic center. The courses will be taught in English and Portuguese. The first class will be held in the evening. Classes will be held two hours each with half an evening for eight weeks. Courses for air navigation, meteorology and radio communications will also be included in the curriculum.

Stevens Institute of Technology is now offering a program of evening graduate courses intended primarily for engineering graduates. A few of these courses are in the general field of basic sciences, others are in the field of specialized persons who are not engineers. Courses carry graduate credit toward the degree of Master of Science for those who are admitted to candidacy for this degree. Basic evening courses

are scheduled for one two-hour session per week for a semester of 16 weeks and carries 16 credits. Preparation of four hours per session is expected. Basic courses include engineering mechanics, problems of manufacturing processes, problems of metallurgy and descriptive psychology.

The model shop at Cooperages School of Aerodynamics, under the direction of George Colwell, has recently installed the latest type of metal cutting band saws. These saws, which are made by the Crucible Company, have a capacity feed of 100 ft. per minute and adjustment of saw type and blade of machine, just as in metal shops in industry.

22 new students which began to attend the Aviation Cadet School at the Technical Institute during the month of June and 18 received their diplomas and were immediately placed. The entire program had a capacity enrollment of 200. Captain W. G. Tamm, in command of the Field at Santa Monica, is conducting the flight test of the DC-4. It is fitting to note that among the first men who worked on the design and development of the DC-4 was Sam Evans, a Curtiss-Wright Tech graduate of 1938, who is doing electrical installation work at the Douglas plant.

Practical airplane design and manufacture will be studied at the Los Angeles Airplane and Flying School, under plane designer and engineer, Fred L. Johnson. The students under the direction of staff engineers, are now at work on the design of the first ship. Following completion and flight tests, other ships will be built. Each new plane will



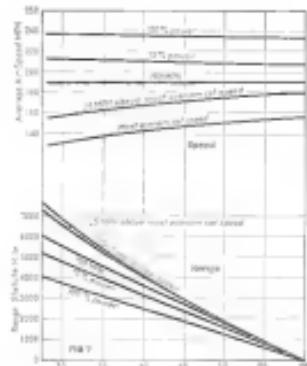
LEARNERS TO FIELDS. Students at the Aero Industries Technical Institute using a very old KTA restoration model. It is identical to the type used in some of the large aircraft factories.



NEW LUSCOMBE 8. The biplane's all-metal light plane last flown at MacCoy Airport, West Tisbury, N. E.

Range vs. Payload

(Continued from page 27)



3000 lb and a span of 340 ft. The relation between drag coefficient and lift coefficient is given by figure 1. The engine fuel consumption is determined by figure 2 for running conditions. The fuel power specific fuel consumption at 40 lb. fuel per hour horsepower is:

The present calculations are performed from the RMEP (10), RPM (11) and engine displacement.

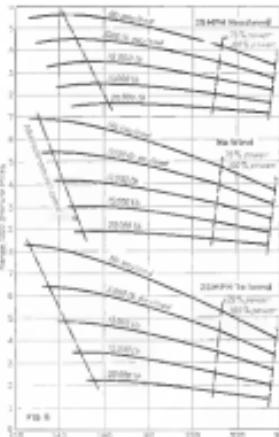
The specific fuel consumption SFC (12) is determined from the RPM (10) and engine RPM (13) and RMEP (12). The pounds of fuel used per hour (14) is obtained from the SFC (12) and RPM (13).

The pounds of fuel used per hour (14) is obtained from the RPM (13) and the SFC (12). This relation is given by the formula $\frac{W}{R} = \frac{SFC}{RPM} \cdot RPM \cdot 60$. The pounds of fuel used per hour (14) is determined from the speed (7) and the RPM (14). Thus column 15 gives values of specific range, M_i / h , of fuel, as a function of weight (6), speed (7), RPM (14) and RMEP (12). The effect of changing the weight of the aircraft is determined from the formula $R = \frac{W}{SFC} \cdot \frac{1}{RPM} \cdot 60$.

At the bottom of Table 2 the shown horsepower at certain high speeds and weights are calculated.

These values are plotted in Fig. 3 as well

as curves of power available for the



engine operating at full power and also at 75% power.

The brake horsepower (B) is determined from the thrust horsepower (T) and efficiency (E). The engine RPM (13) is determined from the velocity (V), V/RD (14), propeller diameter, and gear ratio.

The present calculations are performed from the RMEP (10), RPM (11), RPM (12) and engine displacement.

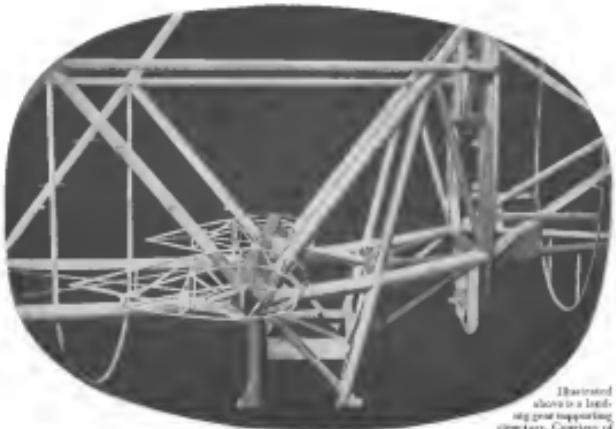
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(Continued from page 27)

(Continued from page 27)



Illustrated above is a landing gear supporting structure. Courtesy of Bellanca Aircraft Corp.

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Carries 18 soldiers as a troop transport or an ambulance, accommodates 8 patients on stretchers. Has extreme utility as cargo carrier, with accommodation for carrying compressed aircraft engines, or two tons of payload.

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Range vs. Payload

(Continued from page 71)

specific range curves to Fig. 6, from no load constant to any value of load considered. The constants or lines required to construct any given range curve can be obtained directly by integrating the specific endurance curves of Fig. 6. This has been done and the results are plotted in Fig. 7 to range versus weight at the end of the flight for the two conditions. Also plotted are the average speeds during each flight which are shown by dashed range by endurance.

In order to plot the results in the most comprehensive manner, the range/payload speed plots shown in Fig. 8 have been placed. This chart is obtained from Fig. 7 by plotting range versus weight at a given speed at the end of the flight. In this case, the example airplane the weight of the airplane, engine, fuel, oil and payload is 20,000 lbs. The difference between 20,000 lbs and the weight at the end of the flight is payload. Then, for constant values of payload, curves of range versus weight are obtained. These are shown in the bottom of Fig. 8 for all speed. The chart is modified at the top and bottom of Fig. 8 to represent the range versus speed with a 25 MPH headwind or tailwind. This is done by multiplying the range by the ratio of ground speed to air speed. The difference between these speeds is the wind velocity. Thus one chart presents the complete range speed/payload picture for this airplane.

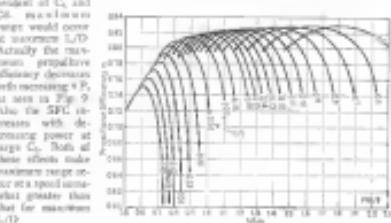
It will be noted in the foregoing that no account has been taken of the loss of range due to low fuel load. This is a serious omission, particularly in the desert at the end of the flight. Practically this omission is probably entirely justified.

An examination of the results for the example airplane will show many interesting features. The results for the example airplane are at all ways typical of nearly all long range airplanes. It is seen in Fig. 4 that at high weights and speeds the BMEP may become quite large and in fact, the optimum value of BMEP may exceed the maximum allowable rating. In these conditions the engine will be operating at full cranking throttle during the first portion of the flight. This is true of most airplanes.

It can be shown that for fixed C_s , η , P_{th} , and V/RD the engine BMEP is proportional to weight and independent of altitude. It can also be shown that for fixed C_s , η , P_{th} , and V/RD, same conditions are a function independent of altitude and weight. That requires some slight increase in BMEP with altitude as Fig. 2. It is assumed that the SFC values as given in Fig. 2 are independent of altitude. This is not necessarily true but it can be assumed without loss of generality that the specific fuel consumption is very little change in BMEP with altitude. Since the BMEP increases proportionally to the speed with increasing altitude, the miles per pound of fuel or specific range is nearly independent of altitude at constant C_s . The effect of altitude is to increase C_s and, therefore, to increase the specific range.

An examination of Table I shows that the best specific range is not at maximum propulsive efficiency nor at minimum fuel consumption. In general the best condition occurs with intermediate load per unit engine maximum. Practically this means at very low values of RPM and shows that for best range the engine must be throttled by increasing the propeller pitch rather than by slowing the engine throttle.

It is seen in Fig. 4 that the speed for best range decreases with decreasing weight. This is contrary to popular belief. Actually at least load the best range occurs at very severe限制 of C_s and thus constant value of C_s and thus constant value of η . At a weight somewhat less than maximum C_s and η are still good and propulsive efficiency were still



Referring to Fig. 8 the effect of average speed on range can be seen. The loss in range when flying at speeds 20 or more miles per hour above speed for best range is very small. This is probably true for most aircraft. However, the effect of speed on range is to increase the range in the direction of the wind.

It is seen in Fig. 8 that the speed for best range decreases with decreasing weight. This is contrary to popular belief. Actually at least load the best range occurs at very severe restriction of C_s and thus constant value of C_s and η are still good and propulsive efficiency was still

good. The procedure used in this report to estimate range after a very brief review of the literature is to assume that the range is proportional to the square root of the total available energy. This is probably true for most aircraft. The effect of the range after a very brief review of the literature is to assume that the range is proportional to the square root of the total available energy. This is probably true for most aircraft. The effect of the range after a very brief review of the literature is to assume that the range is proportional to the square root of the total available energy. This is probably true for most aircraft.

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Airplane Maintenance

A Textbook for Airplane Mechanics

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522 pages, 222 illustrations, \$3.00

This book presents the material needed by those who work as aviation flight mechanics in the large rapidly growing network of national and international airplane lines, also a great many reference facts that will help the mechanic in his work. It gives practical information on materials and construction of airplanes and their parts, repair shop equipment and methods, servicing, testing, etc., with special attention to short-haul aircraft. More than 50 chapters have been added in making a thoroughly authoritative book.

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The book begins with an analysis of the qualifications of an airplane mechanic and their importance in this specialized trade and that goes through to all the essentials of the mechanic's work, his equipment, principles of structures, metal-working, etc., needed in a background for good work. Methods are clearly explained and fully illustrated, and job training is made easy by over six hundred step-by-step job units. Exercises and tests for ten days follow.

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AVIATION

August 1958

18

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Wyman-Gordon laboratory controlled forgings
have been the standard for aircraft



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This book begins with an analysis of the qualifications of an airplane mechanic and their importance in this specialized trade and that goes through to all the essentials of the mechanic's work, his equipment, principles of structures, metal-working, etc., needed in a background for good work. Methods are clearly explained and fully illustrated, and job training is made easy by over six hundred step-by-step job units. Exercises and tests for ten days follow.

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Fix Calculator

(Continued from page 81)

the multiplication of the functions by means of addition and subtraction by various combinations of differentials first. The required accuracy of the machine is made possible through the use of a system of weights which are known from which four-place accuracy is obtainable from a sum only 8% as accurate. These sums as well as the general scheme of the machine are Mr. Nixon's invention. Center-type dials at the top and an odometer are used to measure the average ground speed. The average is the average of readings taken. To eliminate the maximum rating and service of the machine they are made up as a group of twelve major subdivisions each of which can be individually inspected and tested before being used on the dial plates. The machine is precision built and extremely reliable. Any subdivision can be removed without disturbing the others. The manufacture of the individual parts must of necessity be performed with a high degree of accuracy so that the 250 hours employed will be used mainly in the final assembly and test and to extremely close limits of diameter and concentricity. High grade gage and fixtures insure accurate center distance. The final result is a gear system which can presumably withstand breakage and yet is very free from vibration.

The task was with the contractor may be used or dictated by Mr. Compton's experience. He had never run or loaded one until about two days before the Hughes Round the World Record Flight. The minutes of explanation and two hours of practice made him proficient in its use.

The task with which the contractor may be used or dictated by Mr. Compton's experience. He had never run or loaded one until about two days before the Hughes Round the World Record Flight. The minutes of explanation and two hours of practice made him proficient in its use.

Hughes Radio

(Continued from page 27)

Radio headroom for the flight communication system were set up at the regular flight headroom at the New York World's Fair. This was the control point for the activities of our amateur radio station at the 1939-40 New York World's Fair. At the time of the opening of the Fair, the amateur radio station was located in a building which had been converted into a radio room. The station was located in a building which had been converted into a radio room.

Amateur wireless, probably, is the clearest of propeller data. The V/RD and P, the power and propeller torque, are the most important factors in determining the performance of a propeller. The power is constant speed, altitude and weight constant, ρ , P . By plotting V/P , versus V/RD curves can be drawn similar to those in Fig. 9 but with

National 2440 type, were used at the Fair station both in gathering the wind data and in calculating the effect of the various revised stations call the plane propulsive. In view of this, the plane could regain its take-off conditions more easily without leaving the airfield when due to trim-control and antenna decoupling. The plan provided for changing the antenna position on the ground so that where it could be handled safely.

Shortly after leaving Yatka the plane circled MacLennan Memorial Beach and descended approximately with both CW and prop. The distance later indicated that the aircraft was approximately 3,000 inches which would consume rest P for radio communication from a plane especially in place.

Hughes Weather

(Continued from page 24)

Mr. Hughes and the crew might have a formula for the next leg starting from the last one arrived. Once we were clear of the Pacific Ocean the magnetic course was carried directly to the pilot by Mr. Purcell from the station at the World's Fair in order that advantage might be taken of most recent data with the attendant assistance in arriving in the destination.

Range vs. Payload

(Continued from page 14)

practical method of flight tuning for range. The results developed here are based on the assumption that the radial engine torque is W_{RD} . The accepted value, however, is torque per pound of fuel consumed times the additional data required. The weight during the task must be known. The true weight of an airplane is not known, but the total weight is known, and the weight of the propeller can be shown as a function of ρ . These values can be plotted as in Fig. 4 and moments of propagation can be started out as an estimate.

Another interesting possibility is the choice of propeller data. The V/RD and P , the power and propeller torque, are the most important factors in determining the performance of a propeller. The power is constant speed, altitude and weight constant, ρ , P . By plotting V/P , versus V/RD curves can be drawn similar to those in Fig. 9 but with

the ordinates divided by ρ , P . The resulting plot shows the propeller efficiency and the shape of the curve can be compared against Fig. 9 to obtain ρ , P , and to check the propeller data. The airplane drag coefficient can be obtained from ρ , P . If this is done at various speeds and weights the propeller characteristics will easily be checked. It is recommended that the data be plotted in the form of the ratios V/P and V/RD as in Fig. 9. Then the flight time of the data type will be given by the ratio of the ratios. The check data, as in Fig. 9, is as follows:

It is found that the best lift efficiency below peak efficiency for a given P is given by $V/P = 1.0/V/RD$.

It is also found that the peak efficiency is given by $V/RD = 1.0/V/P$.

It is also found that the best lift efficiency below peak efficiency for a given P is given by $V/P = 1.0/V/RD$.

"AEROL STRUTS"

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SPECIAL QUALITY HIGH-CRISTEN SEAMLESS
STEEL TUBING.

The **OHIO**
SEAMLESS TUBE CO.
OHIO GENERAL QUALITY
Shelby, OHIO

C. W. Model 20

(Continued from page 45)

prevent skin wrinkles (also found to be detrimental structurally), and a perfectly streamlined shape of fuselage. All these contribute to low drag—the dimension of the wasting of engine power. Again, no time or expense has been spared to approach as nearly as possible to the aerodynamically perfect airplane.

Another equally necessary for the operator, is complete the elements essential to operating economy. Here again, the two engine installation contributes to any reduction in number of passengers to service and maintain an airplane instead of decreasing operating costs. Attention to engine has been given every consideration the wing design leaves to facilitate incorporation. Ready access to the baggage and express compartment has already been recognized and will prove of real advantage for quick and efficient loading. Also, caution has just recently been made of the inherent advantage of a smaller unit to prevent flooding in case of water damage making an absolute high safety percentage for given traffic conditions.

The Curtiss-Wright "20" described above has been designed as a low flying load. Plant facilities have been augmented by the addition of enough up-to-date machine tools and model shop equipment, and for transportation of materials. A well-qualified organization of workers, including 1700 through completion at the St. Louis Airplane Division plant of the Curtiss-Wright Corporation. Mr. Charles W. Frazee, with years of transport operating experience, heads up the group. Mr. Lesser C. McLean, Mr. George L. Frazee, Mr. John H. White, Manager, and Mr. George Page, designer of the "Condor" and many other successful Curtiss designs in Civil Registration, is assisted by Mr. Leopold, Mr. Perkins, and others, there being more than one hundred engineers and draftsmen now engaged on the project.

The first plane is scheduled to fly by the first of the year. It will, it is believed, be a worthy addition to the fine line of air transports designed and produced in this country and used throughout the world. Designed with full cognizance of requirements of comfort, convenience and performance, and with great regard for safety, the "Condor" represents a particularly outstanding in its design—Safety and Economy.



Congratulations!

Howard Hughes

Lt. Thomas L. Thurlow

Richard R. Stoddart

Harry P. M. Connor

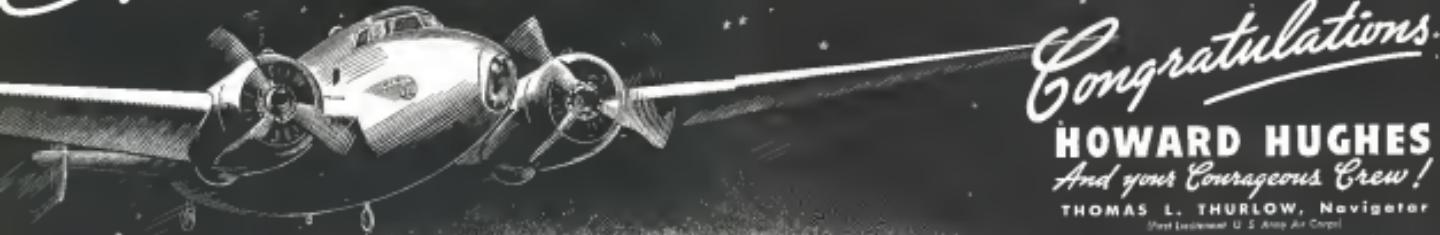
Edward Lund



LOCKHEED AIRCRAFT CORPORATION,
BURBANK, CALIFORNIA, U. S. A.



Around the World in 3 DAYS--19 HOURS



WRIGHT CYCLONES



International Press Photo

In 3 days and 19 hours, Howard Hughes and his able companions, flying a Lockheed 14 transport, powered by two 1730 H.P. Wright Cyclones, reduced by half the popular conception of the size of the world.

The most impressive thing about this flight is not the fact that it halved the previous record, but rather the precision with which it was accomplished. Every stop was carefully planned, then executed with military precision.

It is a tribute to modern engineering that this record-breaking flight was enabled on a standard transport airplane. Standard 14's of this type now do regular service on routes both here and abroad, particularly on KLM, Pan American, and Trans-Canada Air Lines, K.N.E.L.M., Lloyd Netherlands Indies Airways, Pan AmericanGrace Airways and Swiss Air Lines.

On take-offs, with an additional load of nearly 3 tons over the normal rating of the Lockheed 14, Howard Hughes could tap the tremendous reserve of the 2200 H.P. furnished by his two Cyclones.

The amplitude of this reserve is emphasized by the conservative manner in which the engines were

selected to power the
LOCKHEED 14
on this
RECORD-BREAKING
FLIGHT

to maintain the remarkable average of 206.5 m.p.h. for the flight. Only 560 H.P. to 190 H.P. of the 615 H.P. ratings power approved by the U.S. Department of Commerce was used, which left a huge margin of power in each engine.

Wright Cyclone 1100 H.P. engines of the type selected by Howard Hughes for his Lockheed 14 power issues on American Airlines, Eastern Air Lines, Pan American, American, and Trans-Canada Air Lines, K.N.E.L.M., recently released for export sale, Cyclones of this type are also installed in transports now in service on KLM (Royal Dutch Air Lines), K.N.E.L.M. (Lloyd Netherlands Indies Airways), Pan American Grace Airways and Swiss Air Lines.

Dependability under the harshest operating conditions of commercial air transport operation—the dependability so convincingly demonstrated by this record-breaking flight around the globe—is made the Wright Cyclone the choice of leading airlines throughout the world.

Congratulations.

HOWARD HUGHES

And your Courageous Crew!

THOMAS L. THURLOW, Navigator

(First Lieutenant, U. S. Army Air Corps)

HARRY P. McLEAN CONNOR, Navigator

(Lieutenant, U. S. Naval Reserve)

RICHARD STODDARD, Radio Engineer

EDWARD LUND, Flight Engineer



Wide World Photo

You and your able companions who circled the globe in such an incredibly short space of time rightly deserve the plaudits of the world.

Of even greater importance than your speed is the highly successful scientific experiment you have conducted which should contribute so much to the future of long-distance flight.

And too, you have realized the hope that you expressed when you set me free at Floyd Bennett Airport on the eve of your famous flight. "We hope that our flight may prove a contribution to the cause of friendship between nations, and that through their outstanding fleet for whom the kind of aviation transcends national boundaries, this cause may be furthered."

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industry's first "one-stop" convenience, it's easy to take-offs and landings right around the globe!

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第十一章



Maurice Wertheim Penrose, July 23rd, Lower Broadway, New York City

九
四

AGAIN THE NEWS RINGS 'ROUND THE WORLD:



THE FAMOUS Lockheed of Howard Hughes' "New York World's Fair 1939." The front and rear crankshafts of both engines turned in 1938 Bearings. One of the three-bladed propellers that pulled her across the world also turned in 1938 Bearings.

Howard Hughes
Makes it on SKF's

A little more than ten years ago it was the famous Spirit of St. Louis writing new aviation history across the clouds of mid-Atlantic with her single Wright Whirlwind Motor turning, hour after hour, on **ROCKEFELLER BEARINGS**!¹

And now another ship, the famous Lockheed piloted by Howard Hughes and his intrepid crew, Lt. Thomas L. Thawley, Harry F. M. Conner, Richard R. Stoddart, and Edward Lund—writes another startling page. This great plane opens

uses all the startling improvements and all the new features that have been developed through another flying decade. A newer ship—a faster ship equipped with every new device that the engineering genius of a great industry has conceived.

And yet, she has this much in common with the old Spirit of St. Louis and with every other ship that ever took off on a successful transoceanic flight: She made it on ~~gasoline~~^{gas}!



On the Bag Day of aircraft that flew from B-52P-equipped airfields and units associated bases at the Spirit of St. Louis, the Constitution, the America, the Queen Elizabeth, the Womans Star, the Master Cigar King and planes of the crew or temporary companies and of the United States Army and Navy B-52P, Indonesia, Inc., Power House and Blue Heaven, Philadelphia, Pa.

九月
August 2020



FIVE MEN...A PLANE ...AND BREEZE SHIELDING

The greatest example of perfection in modern flight is the glaze-drilling jump of Howard Hughes and his four skilled technicians in their Wright Crokons-powered Lockheed 14.

Bacel was used on this flight more successfully than on any previous long distance flight. Constantly and unfailingly Bacel Radio Shielding on both engine and plane were on the job—proof of the value of Bacel service to the industry.

Behind the glory and heroism of this great flight, lies a wealth of research, thought and tireless effort. Bremse is proud to have played a part in the preparations, thus contributing to the success of this epic adventure of five great men and their plane.

Bosch Products and their proven dependability are available to you.



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PERFECT FLIGHTS DON'T JUST "HAPPEN"

* Howard Hughes' epoch-making flight represents more than an outstanding achievement; it also represents an engineering achievement unsurpassed in aerospace history.

Every material and part used in the plane was chosen with an uncomprromising determination that it must be the finest available.

Under these conditions it is only natural that Mr. Hughes' Lockheed was equipped with Aerol Shock Absorbing Landing Gear Struts which are accepted by the industry as standard.

To support this selective engineers find an ample background of proven performance.

ance. For over twelve years Aerol Struts have enjoyed a preferred position in the industry. They went with Syd to the South Pole—with Elsworth to the Antarctic—with Sir Hubert Wilkins in his several Polar flights. They flew with Dick Merrill in his two round trips across the Atlantic. They are on the big ships like the Douglas DC4, the Boeing XB15 and YB17, the latter the famous "Flying Fortress". Every day thousands of Army, Navy, Transport, and Training planes make better take-offs, safer and softer landings on Aerol Struts.

To any engineer not familiar with the exclusive air-handling principle of these struts we offer the services of our Technical Department.

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CABLE ADDRESS—"PHEUMATIC"

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AEROL shock absorbing STRUT

AVIATION
August, 1938

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CONGRATULATIONS

TO HOWARD R. HUGHES • LT. THOMAS THURLOW • HARRY P. M. CONNOR

RICHARD STOODART • EDWARD LUNO



ON their record-breaking 91-hour flight around the world Howard Hughes and his companion used Goodyear Airplane Wheels and Hydraulics Brakes—standard landing gear on all Lockheed planes because long experience has proved its sturdy dependability. On most Goodyear Wheels the heavy sixteen 12-ton ship roared down the runway into the air. Under the powerful, velvet-smooth, non-freezing action of Goodyear Hydraulic Disc Brakes it pulled up to safe, quick stops. Goodyear is proud of the part its equipment played in this great flight. Wouldn't it be a good idea to have this super-tested landing gear on your ship, too?

Goodyear Airplane Wheels and
Hydraulic Brakes used on his
world globe-girding flight

On your new ship specify

GOOD YEAR

AIRPLANE WHEELS AND BRAKES

AVIATION
August, 1938

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Our Compliments to

HOWARD HUGHES

LT. THOMAS L. THURLOW
HARRY F. M. CONNOR
RICHARD STODDART
EDWARD LUND—



—and to Wright and Lockheed and the other manufacturers whose products were used on this record-breaking flight around the world.



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EAGERLY the world looked on as Howard Hughes, Lt. Thomas L. Thurlow of the United States Army Air Corps, Harry F. M. Connor, Richard Stoddart and Edward Lund completed their record-breaking flight around the world. Eagerly the world hailed their achievement!

SPERRY is particularly gratified that the speedy Lockheed "New York World's Fair 1939" carried a full complement of SPERRY instruments, including Directional Gyro, Gyro-Horizon, and Gyrostat with remote control for the navigator—all of which performed perfectly during the entire flight.

SPERRY GYROSCOPE CO.

INCORPORATED
MANHATTAN BRIDGE PLAZA, BROOKLYN, N. Y.



AVIATION
August, 1939
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EXIDE RODE WITH HOWARD HUGHES AROUND THE WORLD



Exide has just forty minutes to freshen the world, proving that the mighty Earth's aéroplane is a most chip and bonny man.

YOU planned it and you did it, Howard Hughes and your crew—well done! We are proud that Exide Batteries were part of your careful plan... Exide Aircraft-type batteries started Howard Hughes' ship, and furnished the current needed for landing lights, navigation lights, and instrument lights. These same dependable Exides supplied the major portion of the current required to send radio messages, and they stood by faithfully ready to furnish power when needed.

Exide World-Wide Service strikingly demonstrated by the flight... Duplicate Exide Batteries, fully charged, waited at the Paris, Moscow, and Fairbanks landing fields, in case Howard Hughes might need them.

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia
The World's Largest Manufacturer of Storage Batteries for Every Purpose
Sales Division of Canada, Limited, Toronto

AVIATION
August 1939
10



14,716 Miles, at 206.7 Miles per Hour!
FLYING ON

"**NORMA-HOFFMANN**"
PRECISION BEARINGS

IN THE HUGHES WORLD-GIRDLING
LOCKHEED 14

INTERCONTINENTAL AIRLINES PHOTO



The NORMA-HOFFMANN line of *precision* *bearings* and *over-size* *size* *bearings* affords PRECISION BEARING of increased reliability—for engines (including super-chargers), engine accessories, control apparatus, instruments, radio equipment, cameras, and landing field equipment. * * * Write for Catalog. Let our engineers work with you.

Once again, by their performance in an epochal achievement, basic NORMA-HOFFMANN PRECISION BEARINGS justified the confidence and approval of aviation experts. For such a supreme test as this, only bearings of proved dependability could be selected.

The Lockheed Plane (Lockheed Aircraft Corp., Burbank, Calif.) piloted by Howard Hughes in his record-breaking "round-the-world flight, employed NORMA-HOFFMANN PRECISION BEARINGS in its control systems, as well as in its Pioneer, Sperry and Kollsman instruments, and in the Fairchild radio compass Mark RC-6.

"Where the bearings must not fail—on land, at sea, or in the air—choose NORMA-HOFFMANN PRECISION BEARINGS!

NORMA-HOFFMANN BEARINGS CORP., STAMFORD, CONN. U.S.A.

AVIATION
August 1939
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"If I were an ADVERTISING MANAGER"

That's just one of the topics to be delivered anonymously by a masked speaker that will set every man thinking at the Annual Conference of National Industrial Advertisers Association in Cleveland, September 21-23. A second masked speaker will tell what he would do if he were a publication representative.

We're not going to tell you much here—just highlight the program enough to make your mouth water and your heart throb.

T. M. Gorlier, Chairman, Republic Steel Corporation, is scheduled for the opening address and when "T. M." talks he says something. J. H. McGraw Jr. will talk on "What I Would Do Now If I Were An Industrial Advertising Manager."

The new Publisher's Statement will receive full discussion.

Other sessions, as popular last year, will range over a wide range of interesting subjects. Two half-day sessions instead of one. A general conference session will cover such subjects as "Preparing the Plan", "How to Get Better Display Material", "Copy Techniques", "How to Sell Management", "Co-ordinating

Sales and Advertising" and "How and Why to Use an Industrial Agency."

Another session will deal with "Problems of the Small Advertiser", "Production Problems", "Public Relations"—and there are many others.

If I were an Advertising Manager, I certainly would start out to make plans to attend the 10th N. I. A. Conference even if I had to knock-kite to Cleveland. And I would send in my advance registration now to Ed. Bassett, Bailey Motor Company, Franklin Road, Cleveland, Ohio.

IF I EMPLOYED AN ADVERTISING MANAGER—I would make certain that he attended this Conference, because changing times and markets demand a changed viewpoint—a new viewpoint that can be obtained only by hearing discussions by men whose experience is up-to-the-minute—right up to September 21st.



NATIONAL INDUSTRIAL ADVERTISERS ASSOCIATION

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Mr. Hughes' "crossed the world" LOCKHEED, no smaller than LOCKHEDS of this type, is equipped with dependable electrical temperature indicators and other electrical instruments, by WESTON



WESTON salutes Howard Hughes, his flight associates, and the entire LOCKHEED organization on such skillful, sound planning.

Weston Electrical Instrument Corporation, 115 Franklin Avenue, Newark, N. J.

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enjoy widest consideration
when industry buys...

and widest
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XEROX ENSURES THE WORLD YOUR SAFETY

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B★A★30 airplane wing cloth is lighter,
stronger and more closely woven than other
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J. D. COOK

AVIATION SCHOOLS



The great Douglas DC-3 (page 10, left) leading the parade for the first time, driven by its new owners Wright Tech Inc. Photo reprinted from **MORE CURTISS-WRIGHT TECH GRADUATES WORKED ON THE DC-3**, those three of any other school. Curtiss-Wright Tech does not guarantee positions for its graduates—on responsible school work.

A black and white photograph of Donald Douglas, looking slightly to his left. He has dark hair and is wearing a light-colored shirt. To his right is a block of text:

Mr. Donald Douglas
PRESIDENT OF THE DOUGLAS AIRCRAFT CO., SANTA MONICA, CALIFORNIA
Says in a letter to Major C. C. Abrey:

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Quinnipiac Tech APPENDIX A-10. S. Government. ADDRESSED by the State Board
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AVIATION

August, 1944

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more... The Douglas DC-3 takes off at a long speed here by the U.S. Bureau of the Census. —A general California Flyers Service has one of the most extensive flight schools in the country. All day long, nonstop flight support of flying comes, maintaining Here at the school you learn from the best—California Flyers. Island of Aviation in the Los Angeles Municipal Airport. Here is the school in the aviation center of the world, where 33% of America's planes are manufactured. Here is the every plane in the sky on every Classification, from the smallest and back. Discover the secret to the success of planes in helping our nation's efforts. Discover how the place is run on the plane where equipment opportunities are the greatest.



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August, 1944

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